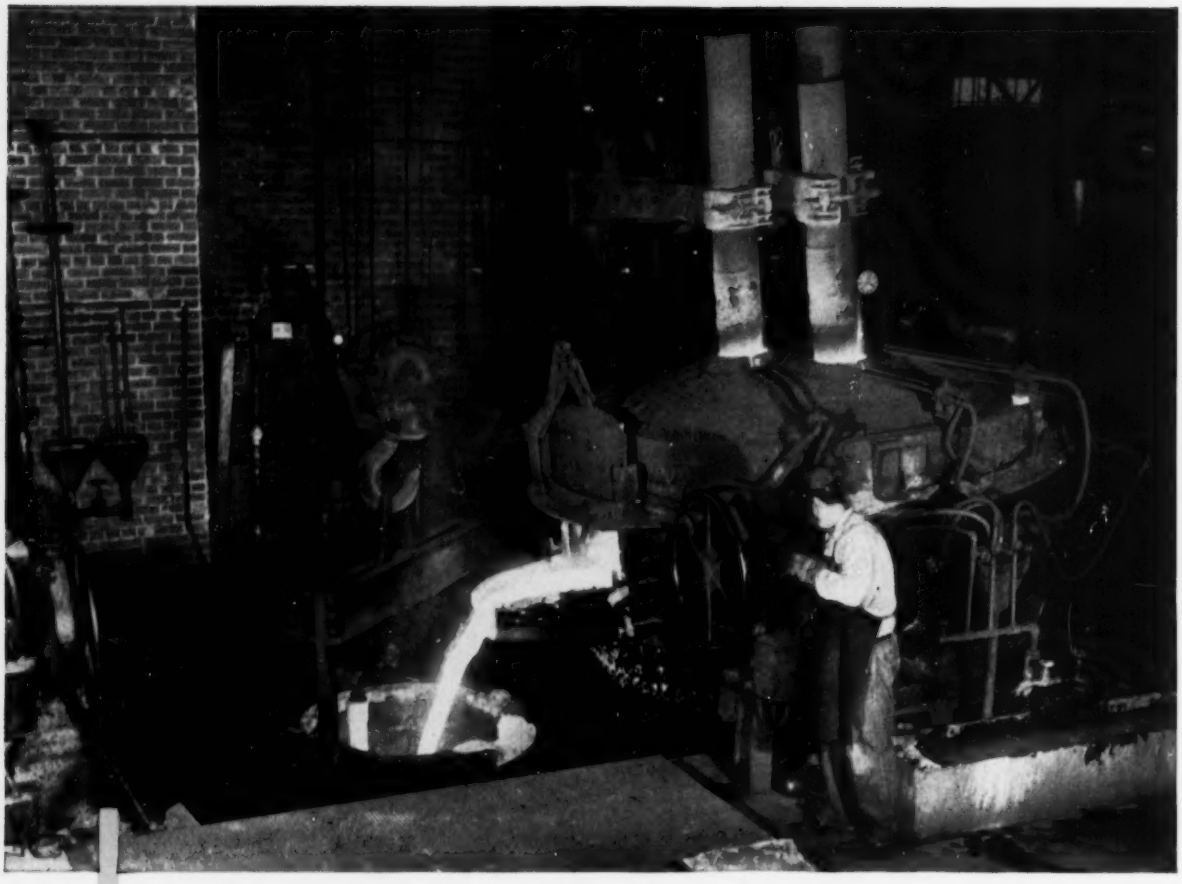
PRE-CONVENTION ISSUE

April 1953

American Foundryman

THE FOUNDRYMEN'S OWN MAGAZINE



29-year-old Lectromelt Furnace still hard at work for Dibert, Bancroft and Ross Co., Ltd. of New Orleans, manufacturers of sugar mill machinery, dredge boat machinery and electric steel castings.

"29-year-old Furnace performs like new"

"After 29 years of trouble-free service this Lectromelt* C-18 Furnace looks only a year old. It performs as well as when installed, turning out 8-ton heats in three hours."

Today's Lectromelt Furnaces are masterpieces of engineering compared to this C-18. And you get even greater durability and dependability.

New Lectromelts, of course, are top-charged to save manpower, speed production, cut electrode consumption and give you added lining life. Power supply and power regulation equipment is specially engineered to fit your installation.

Write for Catalog No. 8, or ask to have an engineer call to discuss your requirements: Pittsburgh Lectromelt Furnace Corporation, 316 32nd St., Pittsburgh 30, Pennsylvania.

Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa. JAPAN: Daido Steel Co. Ltd., Nagoya

*REG. T. M. U. S. PAT. OFF.

WHEN YOU MELT... MOORE RAPID Lectromelt

if yours is an iron foundry...

and your sand additives cost you more than

$1.00 per ton of castings produced

you're wasting money!

The above is quite a serious claim, but we can prove it! First, by establishing the fact that the sand required to produce a ton of castings can be properly prepared with a dollar's worth of CROWN HILL SEACOAL, FEDERAL GREEN BOND BENTONITE and FEDERAL SAND STABILIZER and, secondly, that the use of these three additives produces thoroughly satisfactory results.

The first part can be proved by explaining that at a prominent automotive production foundry, a thorough study of sand preparation costs has been made, using the above three additives. This study proves that the additives for this method of sand preparation cost *less than one dollar per ton of castings produced!*

Proof of the second statement lies in the fact that an overwhelming majority of iron foundries use this method of sand preparation, and do so because it is an easy and economical way to prepare sand and because excellent castings can be produced in sand thus prepared.

So, if you're using *any other method* of sand preparation—using other materials that cost more and require exacting sand control, why not check into this tried and true method—this economical method of preparing sand. We have a new bulletin that tells all about it—and will be glad to forward a copy. Send for it TODAY!

CROWN HILL SEACOAL

Produced by FEDERAL at Crown Hill, West Virginia. *High* in volatile combustible material, *low* in sulphur and ash content—basic requirements for a top quality seacoal. Ground or granulated to properly match the sand used.

FEDERAL GREEN BOND

Mined, processed and guaranteed by FEDERAL and unexcelled in uniformity and ability to develop green and dry strength. Truly the best of the bentonites!

FEDERAL SAND STABILIZER

A processed cellulose sand additive. Its high combustibility allows sand to expand evenly to eliminate casting defects. It increases sand flowability to provide better ramming conditions. And it attracts moisture to broaden the safe moisture range.

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IN TWIN CITIES: Charles D. Gallaher, 11150 S. Old Shakopee Rd., Minneapolis 20, Minn.

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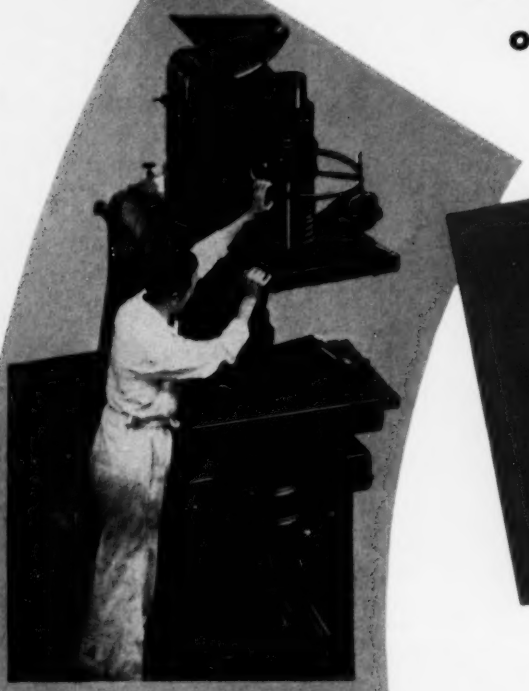

Type BT5 in inverted position, ready for roll-off. Conveyor retracts automatically. Operator stays in one spot — the BT pivots right in front of him.

SPEED: 10-second machine cycle . . . jolt, simultaneous squeeze and rollover, and pattern draw. Capable of averaging 100 24x20 drags per hour. Four-second automatic mold removal.

ACCURACY: Within two thousandths of total draw.

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CAPACITY: BT5, mold area 1000 sq. in.; BT1, 500 sq. in.

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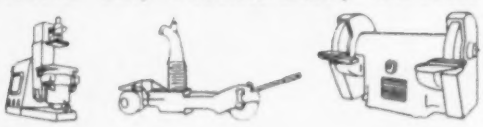
STAMFORD ENGINEERING WORKS, 507 CANAL ST., STAMFORD, CONN.



American Foundryman

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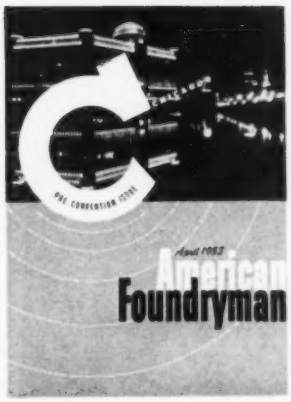

American Foundrymen's Society stages its 57th Annual Convention and Foundry Congress in Chicago during the week of May 4-8, 1953, inclusive, the first time the bustling Midwest industrial and commercial metropolis has been the site of the conclave since 1940. Foundrymen from all sections of the U. S. and other countries will gather for a week-long series of sessions that will explore the newest technical developments and problems facing the industry.

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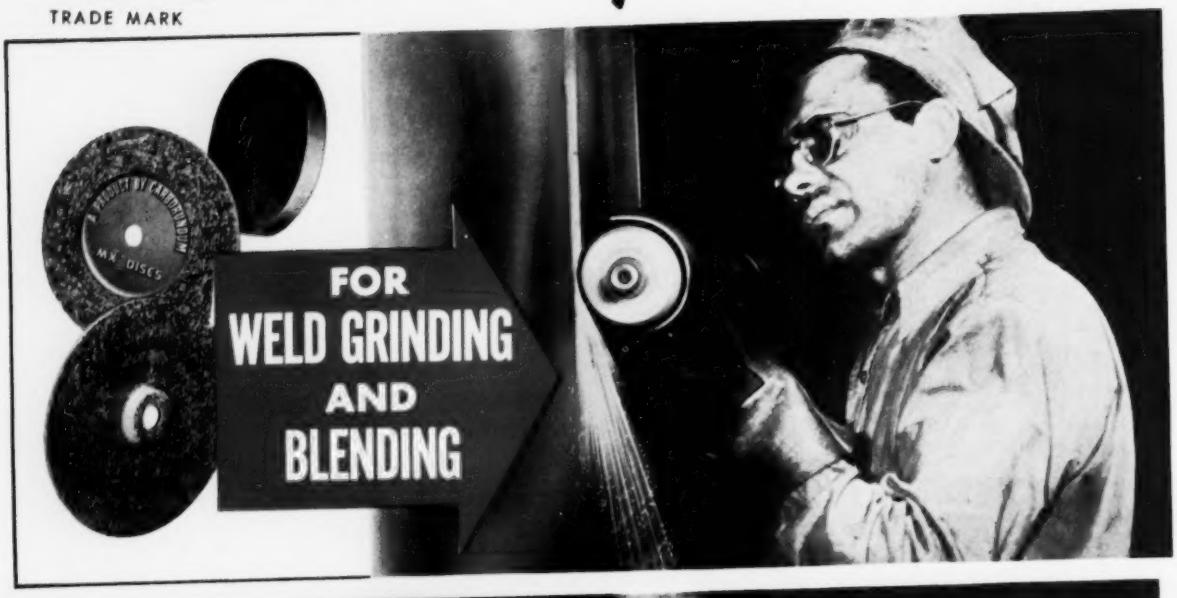

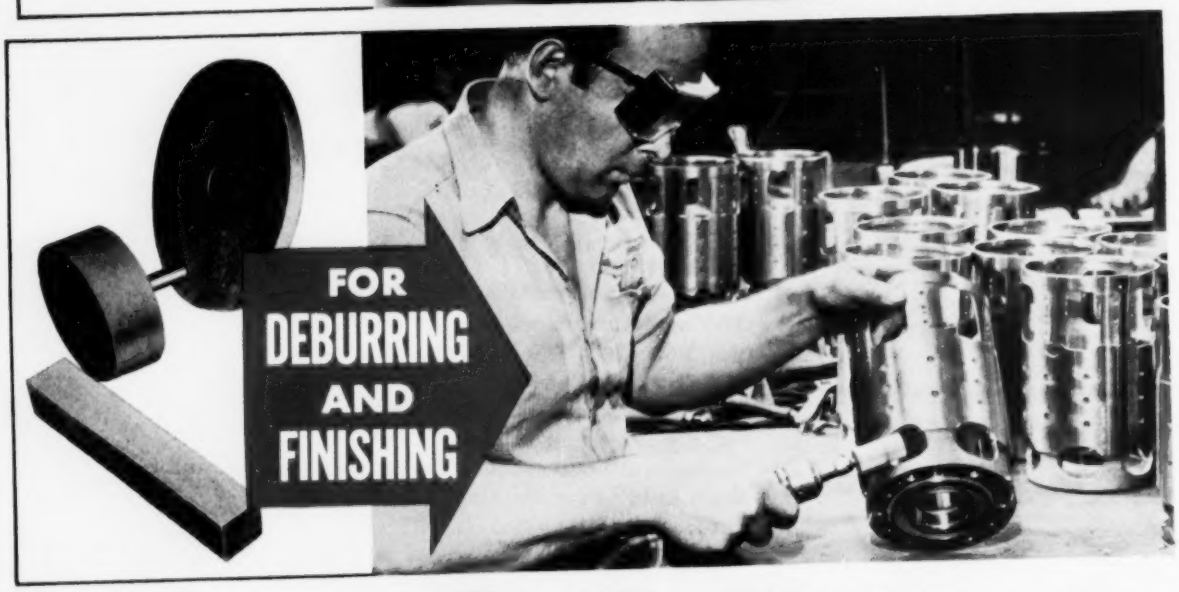

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Talk about versatility in grinding — MX products by CARBORUNDUM have it! For instance, one MX wheel reduces and blends rough stainless steel welds in one operation; another cleans out dainty decorative designs on sterling silver tableware; still another cuts through one inch black pipe in a matter of seconds. And these are but a few of the different kinds of work done by MX products every day!

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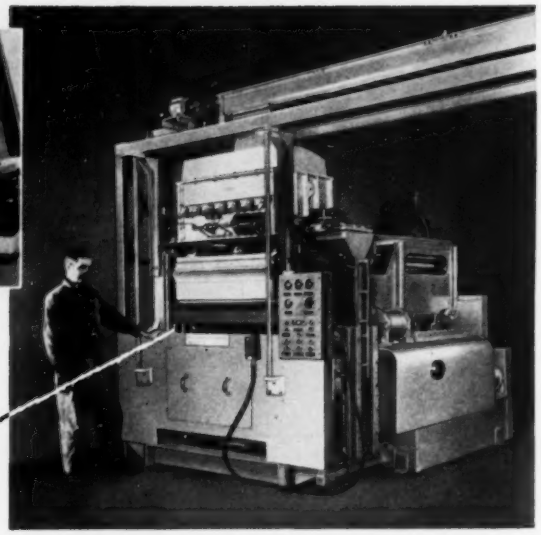

INCREASE SHELL MOLDING EFFICIENCY

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Designed by men with years of experience in industrial shell-molding and built by Shellmold & Machine Co., Inc., of New York City, Model SU-1 is a high-production automatic unit for making shellmolds that produce high-quality castings. With net pattern area of 26" x 41" and 7¼" draw, the SU-1 features the flexibility of time-control of all process steps so essential to uniform production of shells from a wide variety of patterns in automatic-cycle operation. Auxiliary equipment includes an automatic recharge screw-feeder for the sand-resin supply and mechanical shell-removal unit. The silicone parting agent is automatically sprayed on from atomizing jets as the pattern rotates past them (see insert) assuring uniform coverage on every cycle.

. . . the Silicone Release Agent that gives you Clean, Positive Release of shell molds and cores at lowest cost.

The more use you make of the shell process, the greater becomes your stake in uninterrupted shell production. That's why experts in this field specify Dow Corning 7 Emulsion as the parting agent. Equally effective as a release agent for hand or power operated equipment, this noncorrosive, nonflammable silicone emulsion assures continuity of operation with even the highest speed automatic machines.

That's because Dow Corning 7 Emulsion gives easy release and will not break down to form a carbonaceous deposit even at top operating temperatures. The most complex patterns stay clean longer and you cut cleaning costs. You also cut production costs by eliminating stickers, and secure uninterrupted production of shells with consistently high dimensional accuracy.

Dow Corning 7 Emulsion is safe, easy and economical to use. It is easily diluted in water to give any desired concentration. Try it yourself at our expense. Send for FREE trial sample TODAY.

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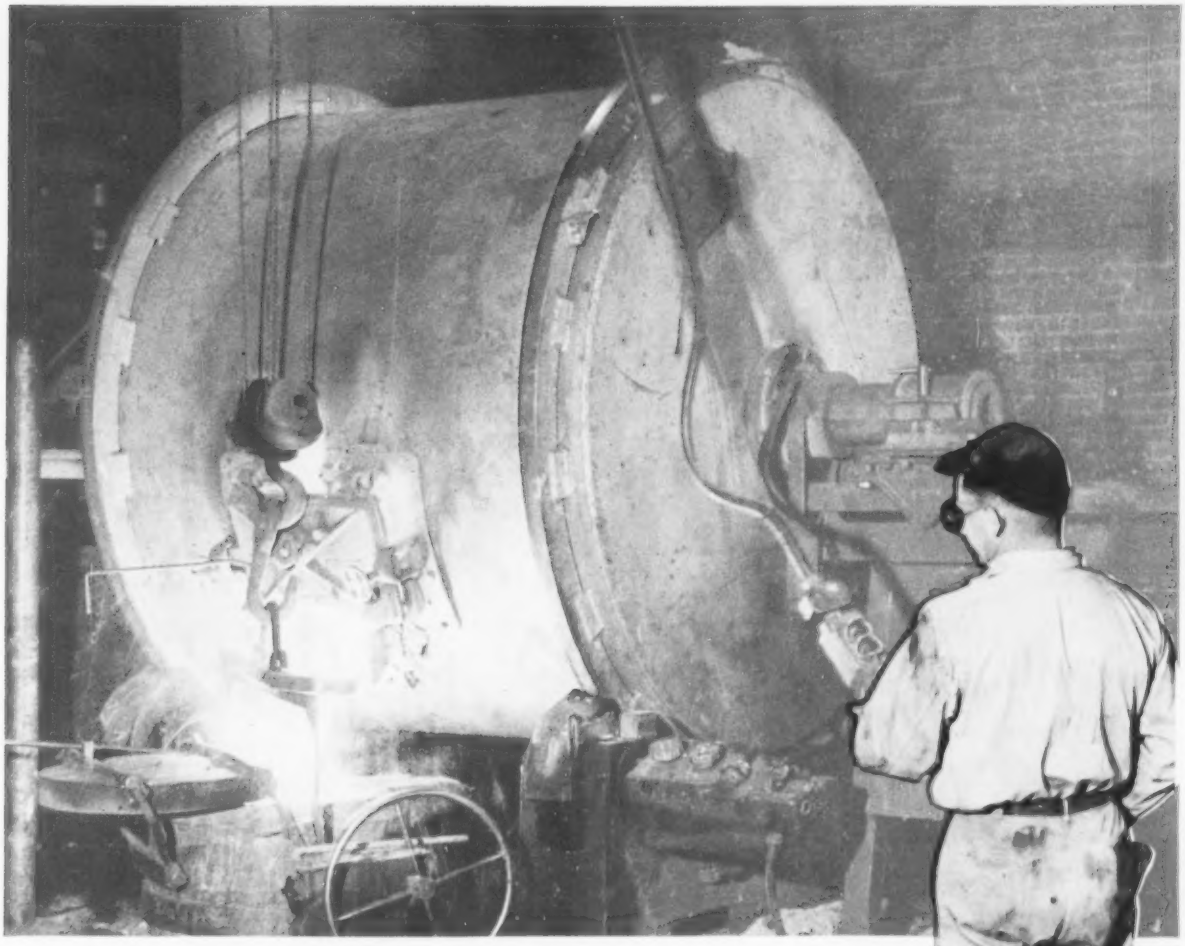
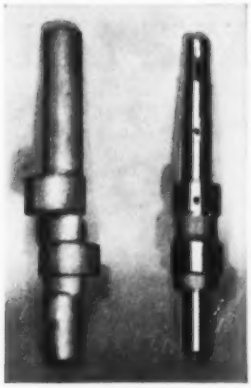


This furnace helps make ice cubes and cool breezes



Raw casting and finished crankshaft of York hermetic compressor. Cast from metal melted in Detroit furnace.

TWO Detroit Rocking Electric Furnaces produce the iron alloys for castings used by York Corporation in their ice-making and air conditioning equipment. The furnace illustrated has an 8000 lb. capacity; the other's capacity is 2000 lbs.

In the York foundry, Detroit Rocking Electric Furnaces were chosen to meet the requirements for high quality heats produced with speed and economy. Rocking action of the furnaces makes full use of heat from the indirect arc, and guarantees a homogeneous melt. Better metal means better castings, fewer rejects, lower cost.

Investigate Detroit Rocking Electric Furnaces for your needs. For ferrous and nonferrous metals. Capacities from 10 to 8000 lbs. Each installation is engineered to fit *your* particular requirement, solve *your* problem.

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60% longer service life from Nickel iron pots

In addition to producing 80 sizes of melting pots, C. H. MILLES FOUNDRY COMPANY devotes a large portion of its production to metal ingot molds.

A service life of 100 days is good for a plain cast iron melting pot.

But C. H. MILLES FOUNDRY COMPANY of Chicago, Ill., wanted to provide even longer life in the pots they cast.

So they experimented and found that cast iron containing 1.00 to 1.25% nickel would give longer life.

In fact, a typical comparison gave a life span of 160 days for the nickel iron to 100 days for plain iron—an increase of 60%!

Melting pots and ingot molds such as are shown here are typical of the nickel cast iron parts used in elevated temperature applications. At temperatures up to 1300°F. nickel alloyed cast irons maintain a higher proportion of their room temperature strength and hardness, and show less growth and scaling, than unalloyed irons. For applications involving temperatures as high as 1500°F. the austenitic Ni-Resist® compositions are recommended.

At the present time, nickel is available for the production of nickel cast irons and other alloys containing nickel, for end uses in defense and defense supporting industries. The remainder of the supply is available for some civilian applications and governmental stockpiling.

INCO

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Dept. 20, 67 Wall Street, New York 5, N. Y.

Please send me booklet entitled, "Guide to the Selection of Engineering Cast Irons."

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Repeat orders for

COLEMAN OVENS

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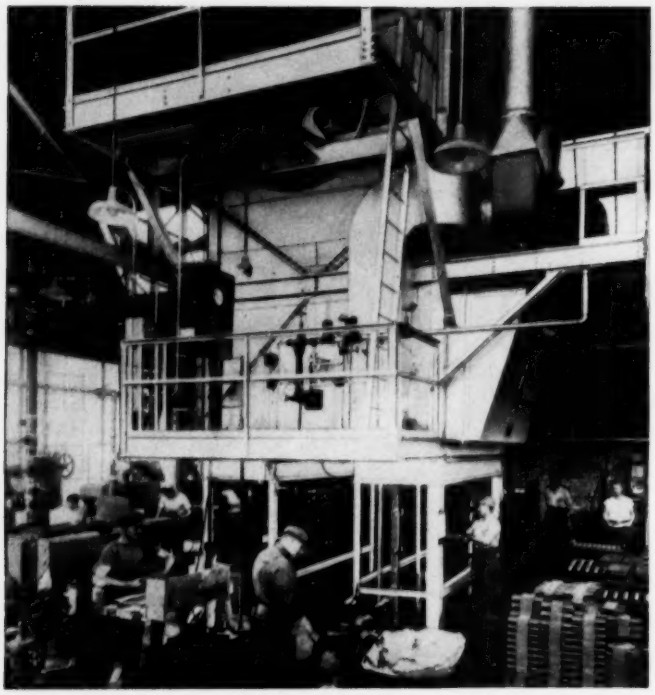
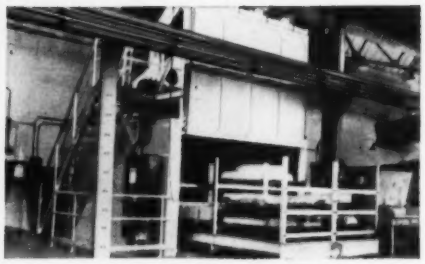


Coleman Tower Oven at Wells Manufacturing Co.



Coleman Car-Type Core Ovens at Pettibone-Mulliken Co.

Coleman Car-Type Mold Oven at The Bullard Co.

Battery of Coleman Transrack Core Ovens at The Crucible Steel Castings Co.

You should get all the facts concerning the core and mold ovens you expect to install... because the right ovens will increase your production and your profits. Over 80% of Coleman Ovens are "repeat orders" from past customers... proving performance to *complete satisfaction*. Coleman Ovens are the choice of leading firms in every branch of the foundry industry from small shops to large production foundries. You get over 50 years of know-how and experience in every Coleman Oven, so why gamble with inferior designs? Coleman Ovens of proved performance cost no more... and pay for themselves quickly out of savings in fuel, labor and increased production. Get the facts today...

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A COMPLETE RANGE OF TYPES AND SIZES

for every core baking and mold drying requirement:

Tower Ovens
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Horizontal Conveyor Ovens
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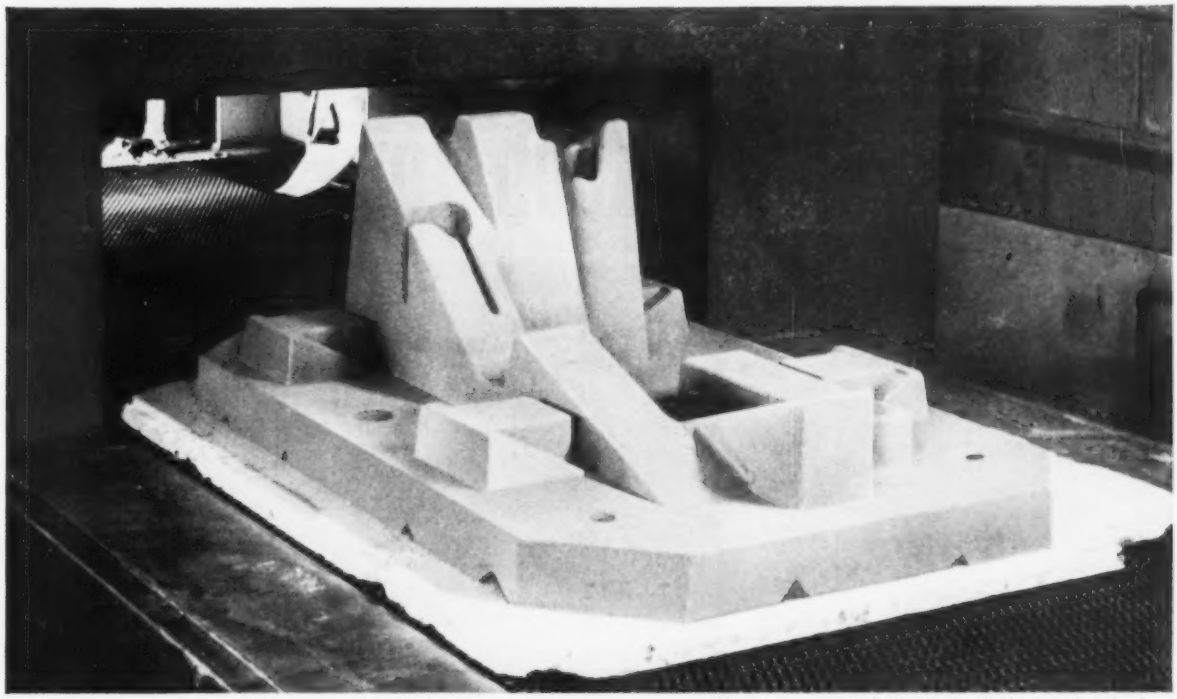

Photo Courtesy of Wollaston Brass and Aluminum Foundry Co.

New odor-free urea core binding resin

Monsanto's Resimene 970 cuts baking time up to 40 percent, compared to oil-bonded cores...

To its long list of research-built resins serving the foundry industry, Monsanto now adds Resimene 970–a new urea formaldehyde core binder that eliminates odor at the muller and core making station, and produces better baked cores in 40 percent less time.

Resimene 970 produces unusually accurate cores with sharp edges and no loose sand grains to rub off. Cores have greater over-all strength to withstand rough handling; reduce core scrap.

More than this, Resimene 970 eliminates shakeout problems and fissures . . . means less gas, greatly improved water resistance, less oven maintenance, and fewer scrap castings. Also, with Resimene 970 an underbaked core is a rarity.

If your problem is to eliminate unpleasant odors at the muller or core making station – or a production bottleneck – Resimene 970 can solve it. Why not send for full information today? The coupon is for your convenience.

Look to Monsanto for the latest research-built resins for foundry use

Core Binding . . . Foundrymen find Monsanto a ready source of a full line of phenolic and urea core binding resins. Call on Monsanto for the job-fitted resin that best meets your individual needs.

Shell Molding . . . Monsanto produces a full line of resins specifically for the new shell molding process. You – like hundreds of other foundrymen – can look *first* to Monsanto for the latest developments, information and know-how on shell molding.

Lytron 886 Sand Conditioner . . . Another Monsanto development for the foundry. In sand casting, Lytron 886 sand conditioner produces units with superior finish, requiring less clean-up. Lytron 886 reduces rejects, simplifies sand moisture control.

Resimene, Lytron: Reg. U. S. Pat. Off.

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Company _____

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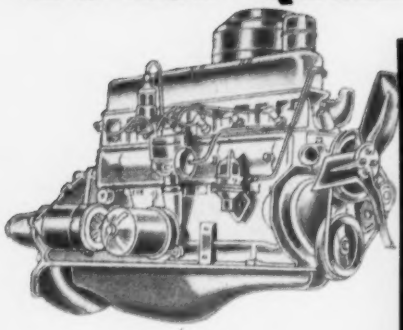
City, Zone, State _____

5 PANGBORN SPECIAL ROTOBLASTS Do Top QUALITY Job for FORD



Pangborn Machine #2 cleaning cylinder blocks. Worker at right transfers castings from grinder to station where two workers in center foreground load them on conveyor hooks for cleaning.

Clean 80 tons of castings an hour at the Ford Cleveland Foundry

At no point are Ford's quality requirements more exacting than at its new Cleveland foundry—production show-place of the Ford Motor Company. That's why it's important that Ford chose Pangborn Special ROTOBLAST® Cleaning Machines to handle the major part of this foundry's blast cleaning. The total output of these five monorail machines will be 80 tons of castings cleaned per hour.

Ford picked Pangborn because parts must be cleaned *perfectly*, even beyond the demands of adequate performance—and *quickly*, to keep pace with other production processes, to keep costs in line! Pangborn can give *you* the same better, faster, cheaper performance. If you have *any* blast cleaning problem, write today for Bulletin 214. Write to: PANGBORN CORPORATION, 1300 Pangborn Boulevard, Hagerstown, Maryland.

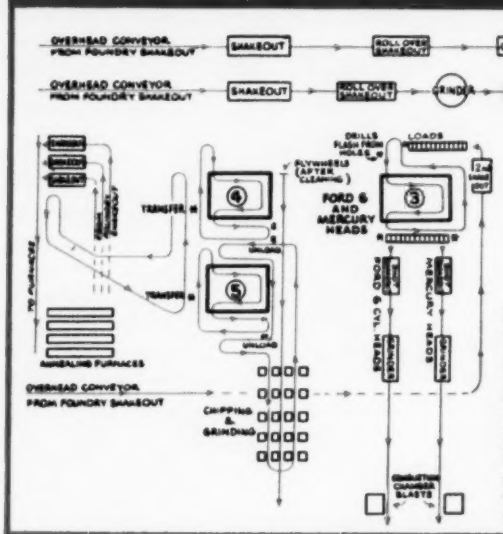


Diagram showing relative positions of the five Pangborn Special Rotoblast Machines at the Ford Cleveland Foundry. Note how work-flow to and from the machines is accomplished. Layout was planned to attain top efficiency in the least amount of time.

OVER 28,000 PANGBORN MACHINES SERVING INDUSTRY

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

FEMA

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BLAST CLEANS CHEAPER

with the right equipment for every job

Talk of the Industry

ONCE AGAIN HOUSE BILL S-368, the so-called Murray Industrial Safety bill, has been reintroduced in Congress, proposing a federal "club" over industrial safety inspections through grants-in-aid to states meeting minimum safety standards set up by the Secretary of Labor. Defeated once, but by a close vote, it is back for another try. Foundry management should make its voice heard . . . this time for keeps.

INDUSTRIAL CONTROLS are off or going off rapidly. AMERICAN FOUNDRYMAN will not try to keep up with these changing regulations, for two reasons: the daily and business press are doing the job well; changes are so rapid that, by the time a monthly publication comes off the press, news may no longer be news.

EVERY ONE OF THE FOUNDRY ASSOCIATIONS in the National Castings Council would prefer to issue a membership plaque of cast metal. Reason they don't: much too expensive. A.F.S. uses laminated plastic (doesn't brag about it), Non-Ferrous Founders' Society has just developed one in etched bronze . . . pretty close. Too bad so many progressive foundries can't display their progressiveness in the products of their own industry.

AIR POLLUTION RESEARCH by the Air and Water Pollution Research Center, College of Engineering Research Div., New York University, is directed toward finding safe, economical, effective methods of using air as a repository for wastes rather than toward preventing foreign substances from reaching air.

JOB SECURITY lies in keeping costs down P. E. Rentschler, president of Hamilton Foundry & Machine Co., Hamilton, Ohio, writes in a recent plant newsletter. You can help, he tells his workmen, by: (1) Producing to the best of your ability; (2) Eliminating waste of time, materials, and supplies; (3) Avoiding accidents by working safely; (4) Avoiding absenteeism which upsets work schedules and reduces earnings.

OPERATIONS RESEARCH at Case Institute of Technology is a program designed to develop application of scientific methods to policy problems. Case aims to: (1) Develop an educational program in Operations Research; (2) Extend methods and applications; and (3) Serve as an Operations Research communication center.

CHEAPLY MADE PATTERNS ARE FALSE ECONOMY John F. Schnur of Armour Research Foundation's International Div. told Institute of Indian Foundrymen in a talk on foundry fundamentals. Patterns are tools and should be of highest quality . . . one time jobs are often run several times . . . the pratice of using makeshift patterns once started is hard to stop, he stated—words well worth consideration by all foundrymen.

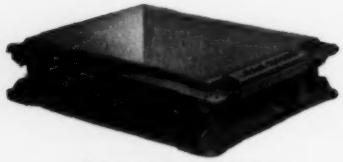
ADAMS ALUMINUM EASY-OFF FLASK

Here's a new and proven operating principle.

Built for You in Any Length, Width or Depth.

Adams Cherry Easy-Off Flask

Adams Jackets, Cast Iron or Aluminum



Adams Steel Jacket

MAKE REAL SAVINGS FROM THESE ADVANTAGES!

RIGID CONSTRUCTION from our proven corner design, permits less weight with no loss of strength.

SOLID CORNERS are of the same design used on Adams Aluminum Slip Flasks. This interlocking tongue-and-groove construction is retained in perfect alignment with bolts secured through tapped end sections and locked with washers and nuts. Important! This construction has proved far superior to other forms of corner design.

MALLEABLE TRIMMINGS are used on Adams Aluminum Easy-Flasks as on all other flasks we manufacture.

OPERATING MECHANISMS are identical with those used on the Adams Cherry Easy-Off Flask and incorporate the same simple adjustment and reversal of locking position.

STEEL PROTECTING STRIPS are standard equipment at top of cope and bottom of drag. Aluminum strips available upon request at no extra charge.

HANDLES AND TRUNNIONS are available when specified.

Write us today for further details . . . or see our representatives at the Convention.

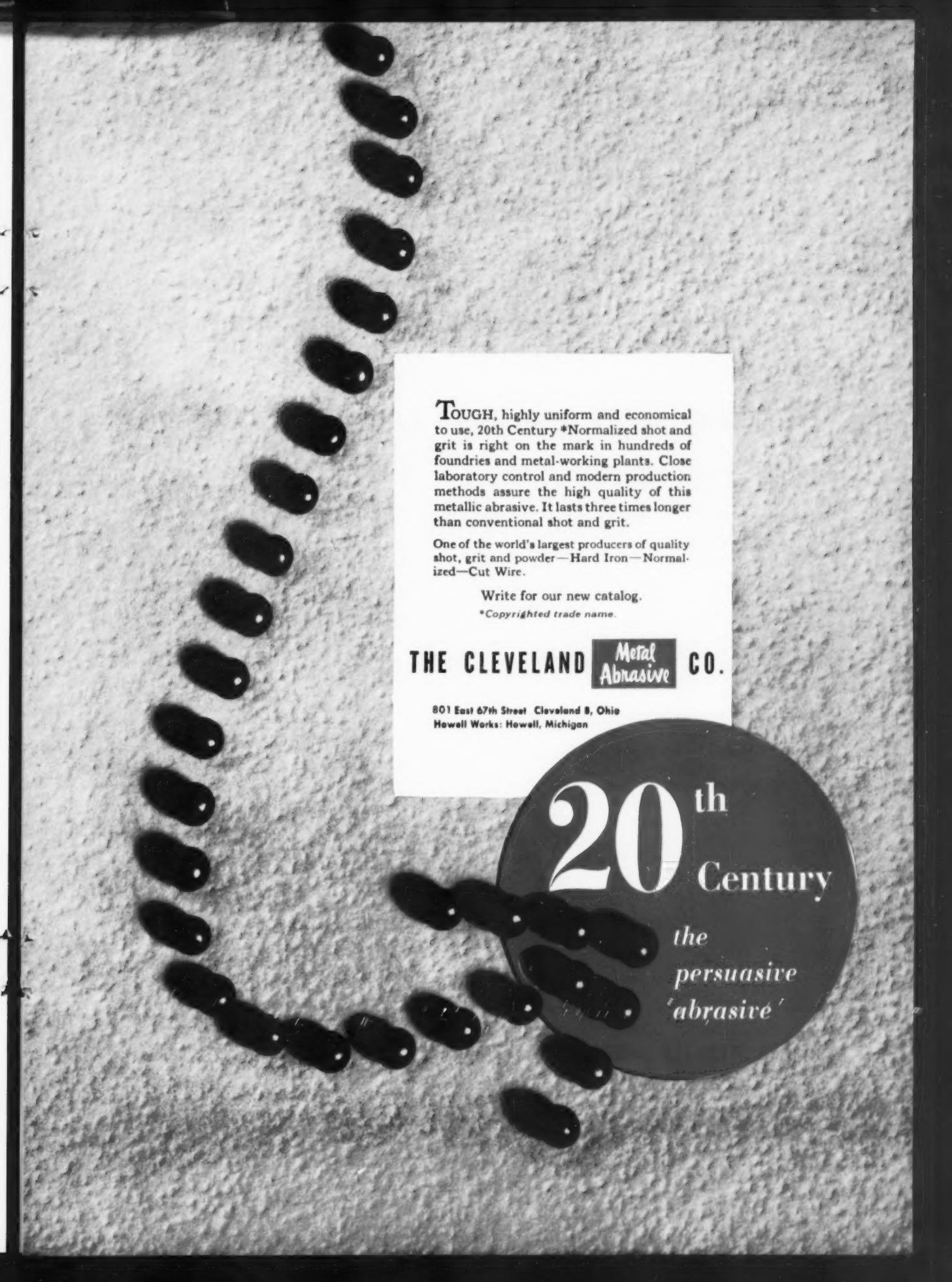
Cherry Snap Flasks — Cherry Slip Flasks — Aluminum Slip Flasks — Easy-Off Flasks — Cherry Presser Boards — Wood Bottom Boards — Steel Bottom Plates — Steel Jackets — Aluminum or Cast Iron Jackets — Steel Bands — Steel Upsets — Cherry or Aluminum Upsets

The ADAMS Company

ESTABLISHED 1883

DUBUQUE, IOWA, U.S.A.

MOLDING MACHINES and FLASK EQUIPMENT


TOUGH, highly uniform and economical to use, 20th Century *Normalized shot and grit is right on the mark in hundreds of foundries and metal-working plants. Close laboratory control and modern production methods assure the high quality of this metallic abrasive. It lasts three times longer than conventional shot and grit.
One of the world's largest producers of quality shot, grit and powder—Hard Iron—Normalized—Cut Wire.
Write for our new catalog.
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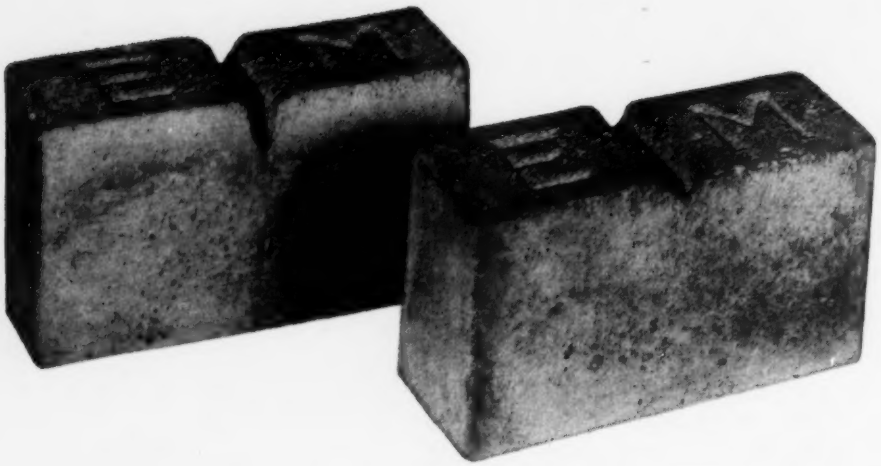
20th Century
the persuasive 'abrasive'



For lower cost and more convenient handling

USE ELECTROMET'S *PALLETIZED* SILICON BRIQUETS

ELECTROMET has added to its line of ferro-alloy briquets, which aid in the production of high-quality castings, new rectangular-shaped silicon briquets. They are stacked on pallets for convenient and economical handling. These pallet shipments, which are available at no extra charge over bulk shipments, can easily be unloaded and handled in your plant by lift truck or overhead crane. Handling costs are reduced and inventory-taking is simplified. The pallets are expendable and need not be returned.

"EM" palletized silicon briquets are about 6 in. x 3 in. x 2 in. in size, weigh 5 lb. gross, and contain exactly 2 lb. of silicon. The briquets are notched, so that they can easily be split in half when 1 lb. additions of silicon are desired. Because they contain an exact amount of silicon, these briquets offer close control of analysis in cupola melting operations.

Silicon is a deoxidizer, cleanser, and softener of gray iron. Silicon briquets offer a practical, convenient, and economical means of adding this alloy. Ask to have one of our metallurgists call and explain more fully the advantages and use of "EM" silicon briquets.

The terms "Electromet" and "EM" are registered trade-marks of Union Carbide and Carbon Corporation.

Pallets holding approximately 4,000 lb. of "EM" silicon briquets can easily be handled by lift truck.

This lifting device is used to handle pallets with an overhead crane. An ordinary sling can also be used.

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for melting

aluminum
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copper-nickel alloys
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Because Lindberg-Fisher builds *all* kinds of melting equipment . . gas . . oil . . electric . . induction, and carbon arc . . L-F engineers are able to recommend, without prejudice, the proper type of furnace for *your* particular melting requirements.

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Sales and service offices in principal cities

Bulletin 951 shows the complete melting line. Write for your copy today.

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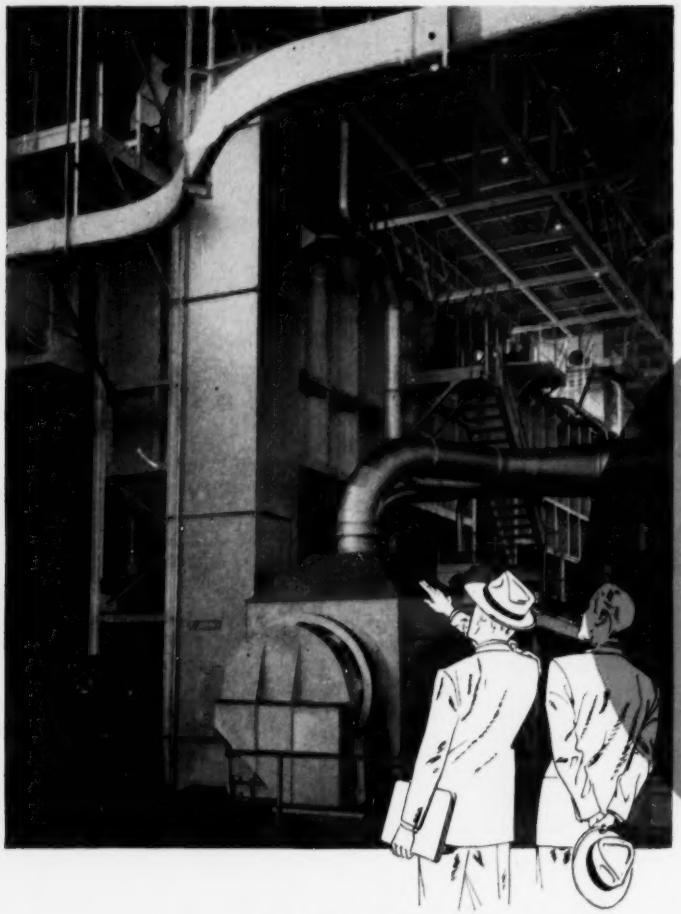


Jeffrey built the heart of the Cleveland Ford Foundry

ALL SAND PREPARATION UNITS: **For 8 molding lines.**

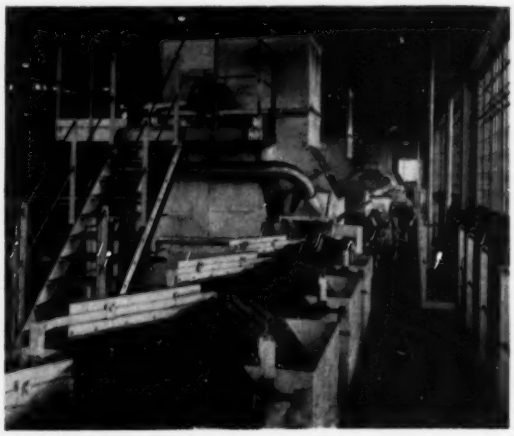
AUTOMATIC OPERATION: **Including sand distribution to 76 molders . . . all cylinder blocks dumped mechanically . . . all drag flasks shaken out . . . all flasks conveyed back to molding stations.**

SAND COOLERS & AERATORS: **Each line equipped with Sand Cooler and Aerator.**

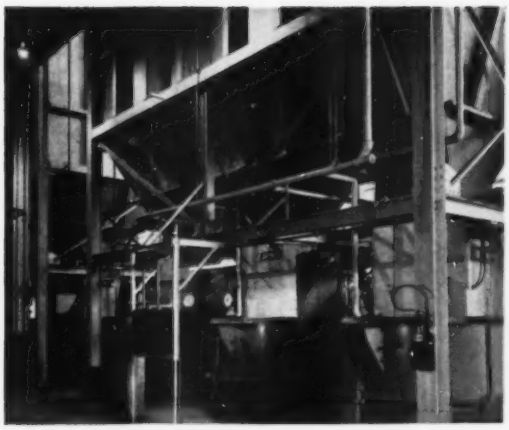
PRECISE PERFORMANCE: **From start to finish, Ford-Jeffrey engineering clicked!**

(Top Photo) Magnetic Belt, Cooler, Bucket Elevator and Sand Storage Bins over Mixers.

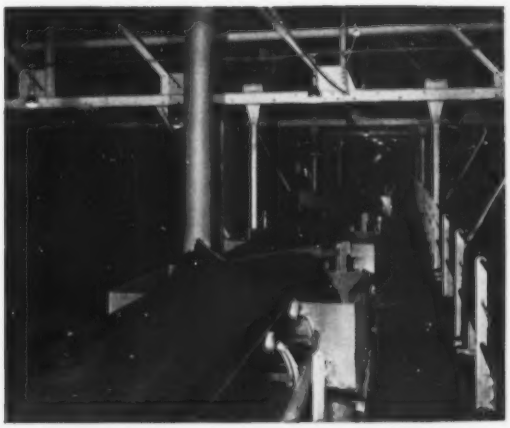
(At Right) Top of one of the 8 Shakeout Sand Storage Bins, showing Elevators and Distributing Belts over bins.



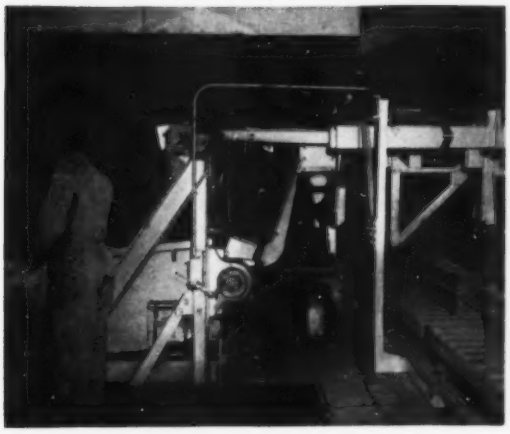
"No Job Too Large . . .
No Job Too Small"



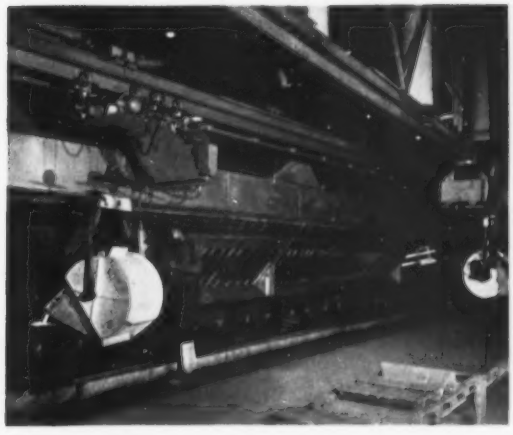
One of the 8 Sand Preparation Units.



Prepared Sand Delivery Belt to Molders.



Automatic Drag Push-off, Castings Dumper and Flask Return.



Pouring Station, showing Pouring Conveyor, Pusher Conveyor for Ladle and Trolley.

Send For Catalog No. 845

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

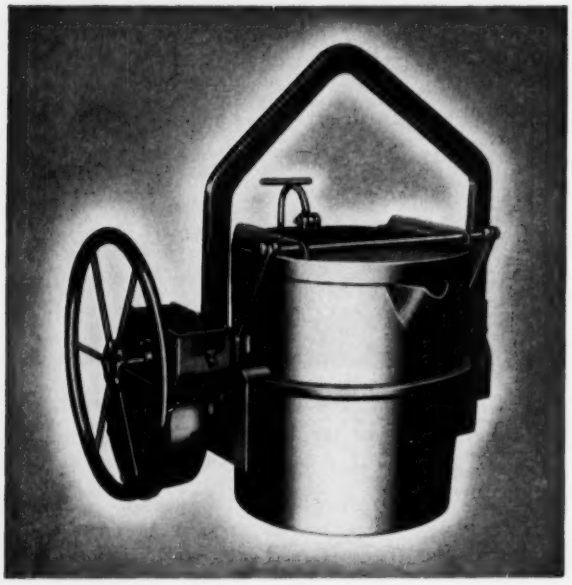
PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED

.....IT'S A JOB FOR JEFFREY!

YOU'LL FIND THE TYPE LADLE YOU WANT AT

Ladle Headquarters



Industrial Equipment has all the ladles: teapot spout . . . covered . . . cylindrical . . . reservoir . . . buggy . . . bottom discharge . . . and many others, standard and special.

Each represents the last word in proven design and operating efficiency. All Industrial Crane Ladles are available with Industrial's revolutionary new universal bail which completely eliminates binding from heat or misalignment.

All geared ladles use Industrial's new hi-safety, self-locking worm gearing which uses no gaskets and which can be easily adjusted by anyone.

Write for Industrial's latest catalog. Illustrations, sizes, dimensions, technical features: all are included.

LADLES

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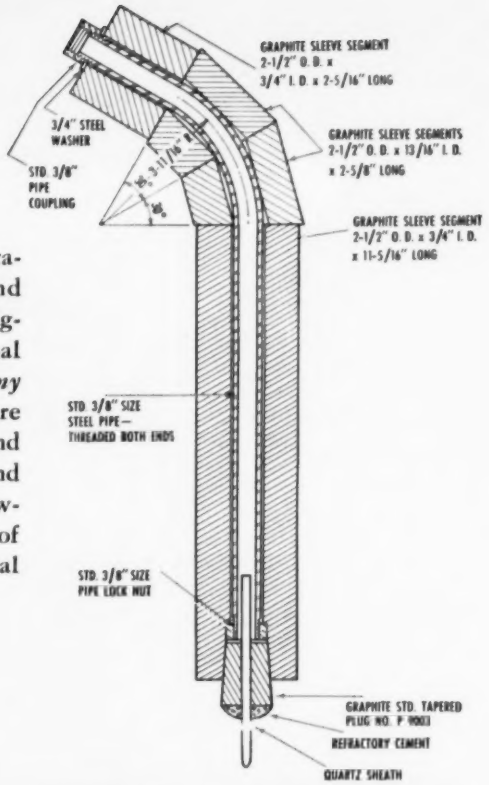
In Furnace and Foundry...

These SMALL PARTS do a BIG JOB

● High temperature applications of "National" Carbon and Graphite are not limited to big-tonnage items. A part of National Carbon's service is to develop *any* application, however small, where the unique properties of carbon and graphite assure a convenience and economy to the user. In the following two instances, a few *pounds* of graphite serve literally *tons* of metal . . . efficiently and at a saving.


GRAPHITE SLEEVE SEGMENT
2-1/2" O. D. x
3/4" I. D. x 2-5/16" LONG
3/4" STEEL WASHER
GRAPHITE SLEEVE SEGMENTS
2-1/2" O. D. x 13/16" I. D.
x 2-5/8" LONG
STD. 3/8" PIPE COUPLING
GRAPHITE SLEEVE SEGMENT
2-1/2" O. D. x 3/4" I. D.
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STD. 3/8" SIZE STEEL PIPE—THREADED BOTH ENDS
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REFRACTORY CEMENT
QUARTZ SHEATH

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Can't be equalled by any other material for the production of purifying gases into molten metal. Graphite won't melt in the bath, can't contaminate the metal. Its low coefficient of expansion prevents cracking and spalling. Metal and dross do not adhere tightly to it. And whatever gases are used, graphite will not corrode.

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Only graphite could provide the degree of low-cost, trouble-free protection required by thermocouple assemblies of this type for the immersion method of measuring open hearth and electric furnace bath temperatures. Reclamation and maintenance for re-use are simple, quick, and economical. Molten metal won't stick to the graphite parts and they're immune to thermal shock.

HERE'S HOW TO LICK HY HEET

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PLEASE SEND INFORMATION ON:

☐ Thermocouple Sheath Parts ☐ Fluxing Tubes

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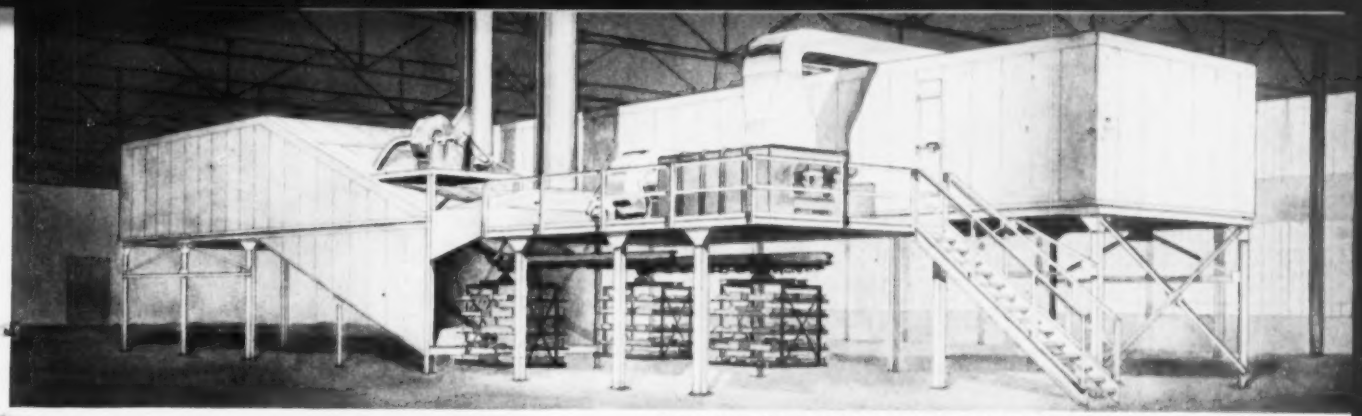
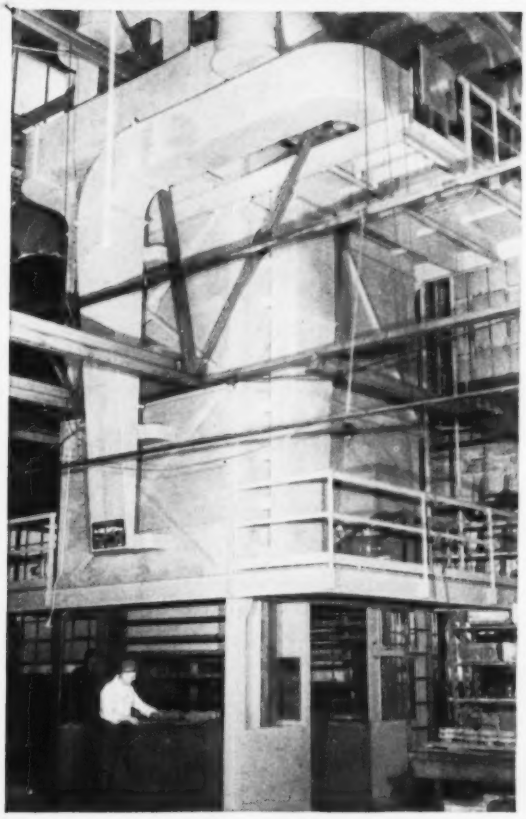
LOW LIGHT BILLS . . .

. . . mark phenomenal acceptance of "EVEREADY" No. 1050 Industrial Flashlight Batteries by a broad cross-section of industry. Delivering twice the usable light of any battery we've ever made before, it will not swell, stick or jam in the flashlight . . . has no metal can to leak or corrode.

BLAST FURNACE LININGS • BRICK • CINDER NOTCH LINERS • CINDER NOTCH PLUGS • SKIMMER BLOCKS • SPLASH PLATES • RUNOUT TROUGH LINERS • MOLD PLUGS • TANK HEATERS



CARL-MAYER HORIZONTAL MONORAIL CORE OVEN at Eclipse Aviation Co.
Patent No. 2355814

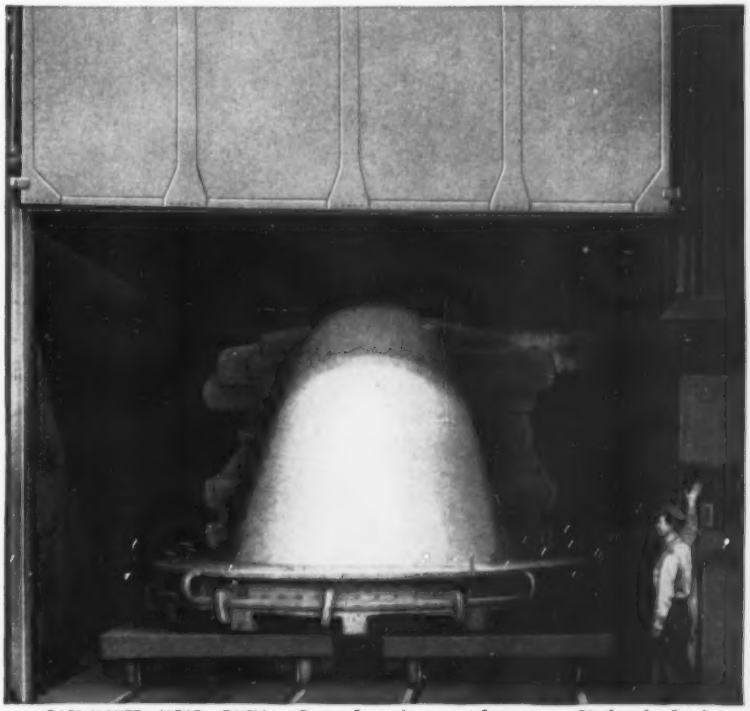


CARL-MAYER VERTICAL CORE OVEN
at G. & C. Foundry Company
Patent No. 2257180

"BIG" Engineering brings big foundry oven jobs to CARL-MAYER

Carl-Mayer designs embody patented features which contribute to highest efficiency and economy in operation. It will pay you to consult us on your next core baking and mold drying problem. We build ovens of all types and sizes, also other types of industrial ovens and furnaces.

Write For Bulletin No. 53-CM.



CARL MAYER MOLD OVEN. One of a battery of two at Pittsburgh Steel Foundry Corp. Capacity: 100 tons per charge (each oven). PATENT APPLIED FOR.

CARL-MAYER CORE AND MOLD OVENS ARE SERVING CONCERNS LIKE THESE:

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THE CARL-MAYER CORP.

3030 Euclid Ave., Cleveland, Ohio

Backed by reputation and over 30 years' experience

1913

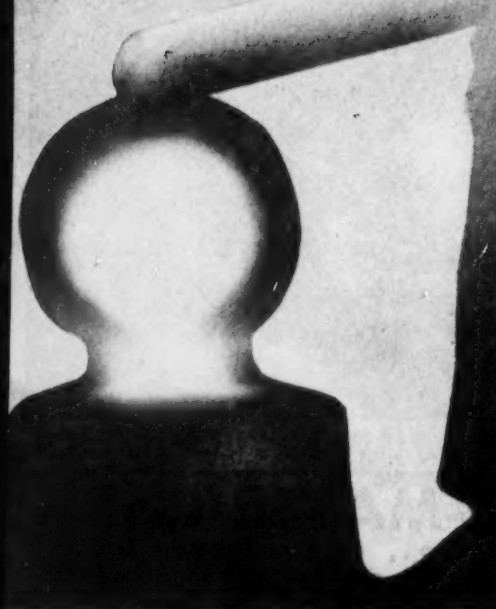
1953

40 years of service

This year City Pattern Foundry and Machine Company is celebrating its fortieth year in business; forty years that have marked many gratifying changes in our plant size and facilities. In 1913, we produced our first pattern in a small second story shop with a total complement of two employees. Today in one of the largest and best equipped plants in the industry our employees number close to three hundred.

However, one thing has *not* changed in forty years . . . that is our unvarying goal to produce the finest in pattern and machine work in the most efficient and economical manner possible.

To the many loyal companies who have made possible the City Pattern Foundry & Machine Company of 1953, we pledge continued efforts to constantly keep our skills and facilities abreast of their needs.



CITY PATTERN

FOUNDRY AND MACHINE CO.

1[illegible]1 HARPER AVENUE • DETROIT 11, MICHIGAN

Products Parade

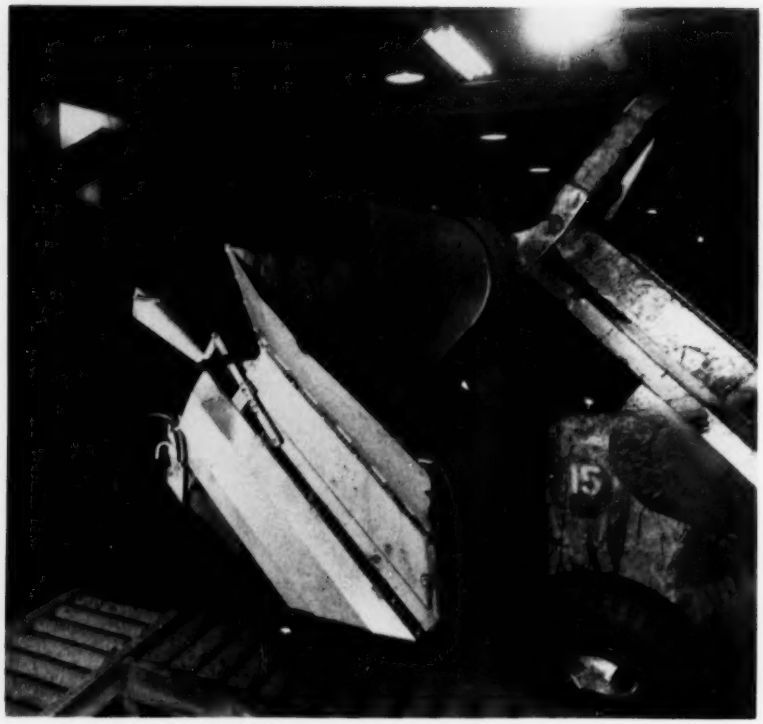
MATERIALS

MACHINES

METHODS

AN EXHIBIT ON PAPER

AMERICAN FOUNDRYMAN presents in these pages its biennial non-exhibit year feature, "*Products Parade*," designed to provide a showcase for the display of the newest developments in foundry equipment and materials at Convention Time, in a year when the A.F.S. Foundry Congress and Exhibit is not held. On the pages of this "Exhibit on Paper" will be found the outstanding tools of the foundry craft developed recently by the nation's equipment and materials manufacturers. More detailed information on products described may be obtained by filling in and mailing the prepaid postcard appearing on page 33, in this section. Merely circle the numbers of the items in which you are interested.



1. New Portable Aerator

Intended for use at individual molding stations, this unit is designed for foundries with centralized sand conditioning system. Has 120-ton-per-hour capacity, large hopper, adjustable gate to regulate flow of material. Compact and sturdy, machine is available in either illustrated stationary model, which can be moved by fork lift, or a portable unit with own four-wheeled carriage. *Royer Foundry & Machine Co.*

2. Current Collector Wheels

Made of Graphitar, a unique and very efficient carbon-graphite material, these current collector wheels are specifically engineered for the rugged, heavy-duty type of operation peculiar to electric cranes. Since the material is self-lubricating, bushings are unnecessary and there is no need to grease trolley wires, effectively reducing maintenance and repair costs. Graphitar is an inert material, uneffected by corrosive action of fumes, heat, cold, rain, sleet or snow. It acts to banish dead spots by virtually eliminating pitting, arcing and burning action. Standard wheels are specially designed to your specifications of ID-OD thickness, groove width and depth, and wire diameter. Essentially a custom-made installation, Graphitar wheels are a definite advancement in the operation of electric cranes. *United States Graphite Co.*

3. Electronic Core Baking Oven

Indicative of great progress made in core handling since the introduction of the electronic oven, this photo shows the equipment in action in a large eastern foundry. Expanding the flexibility of electronic ovens for the industry, these units are now available in sizes that will produce from 500 pounds to 4 tons of baked cores per hour. Complete data on these ovens are available if you circle No. 3 on the postcard, page 33. *Induction Heating Corp.*

STOP DELIVERING PACKED SAND TO YOUR MOLDERS

Royer Model NYS-E aerating the contents of a 10½ cubic foot loader bucket in 10 seconds at the Central Specialty Co., Ypsilanti, Michigan. The approximate total volume handled is 450 tons per day.

In foundries with centralized sand conditioning systems, the sand delivered to the individual molding stations by means of front end loaders, etc., because of the method of handling is usually packed tight. For best molding results it must be aerated. And here is where the new Royer Model NYS-E, a portable aerator designed for loader feeding, fits into the sand preparation picture. Built specifically for this use, the 120 ton per hour capacity of this unit is sufficient to handle a 12 cubic foot load within the time required to empty the bucket and back away. The hopper is large enough to receive the entire 12 cubic feet of sand without spillage and has sides steep enough to insure unassisted material flow. The hopper throat has an adjustable gate to regulate the flow of the material.

Sand from the hopper is fed into the Royer where the "combing belt" action completely blends, mixes and aerates it, discharging a light, fluffy product ready for the molder's use.

The machine is sturdily constructed with heavy welded underframe and base. Compactly built, it can easily be moved from station to station; stationary model NYS-E (illustrated) by fork lift and portable model NYP-E on its own four-wheeled carriage.

Don't scrap the benefits gained through centralized sand control by delivering packed sand to your molders. Improved casting quality results from properly aerated molding sand. Write for more information on the Royer NYS-E and other Royer cost-cutting foundry equipment.

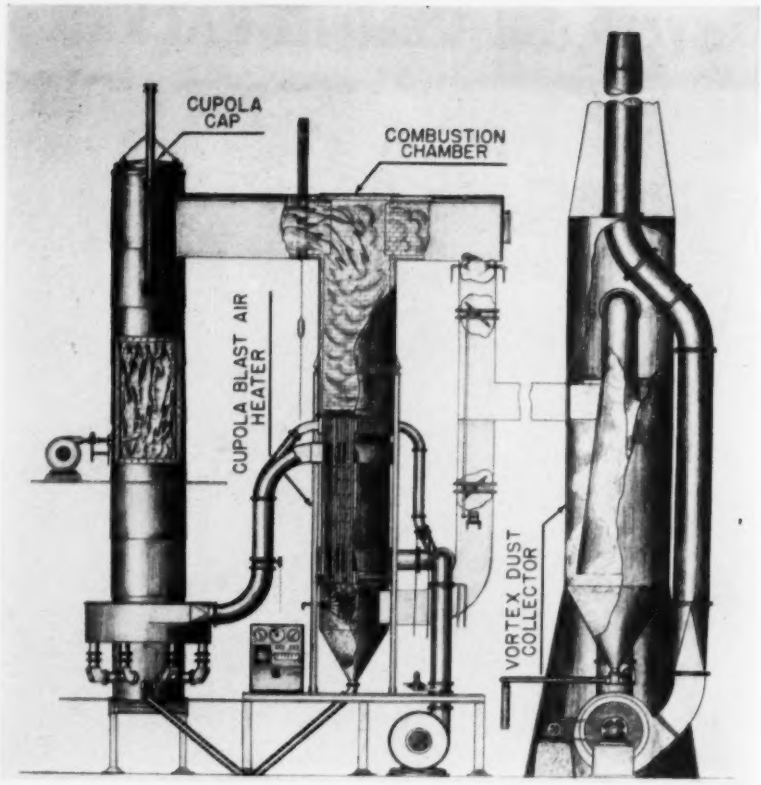
Export Department, 306 W. Washington Blvd.
Chicago 6, Ill., U.S.A. Cable: ASMAN

Foremost in Sand ROYER *Conditioning Equipment*

ROYER FOUNDRY & MACHINE CO. 155 PRINGLE ST. KINGSTON, PA.

4. New Hot Blast-Stack Equipment

A new simplified type of combined cupola Hot Blast-Stack Gas cleaning system uses waste gas from the cupola to provide the blast to the heat exchanger for transfer for cupola blast air at 800 F. Cupolas are completely capped and about 90 percent of dust and all carbon monoxide gas is prevented from escaping to the atmosphere. Savings claimed by manufacturer are significant: 15-20 percent of coke, 5-10 percent limestone, 10-15 percent less metal loss through oxidation, 15-20 percent less loss of silicon and manganese, refractory cost reduced 10-20 percent. Other features include an increase of 20-30 percent in melting capacity, a 30-60 degree hotter metal, an 80-90 percent reduction in smoke and dust, a 15-20 percent reduction in sulphur absorption, and the use of lower grade coke where necessary. The Heat Exchanger is constructed with a single vertical downward pass to assure dropping out the bulk of the cinders and dust from waste cupola gas, and is built with heat resisting fire tubes made of alloyed steel to withstand high temperatures. Built for blast air temperature ranging from 400 F., they are manufactured for application to cupolas with shell diameters of from 21-120 inches. *Grindle Corp.*

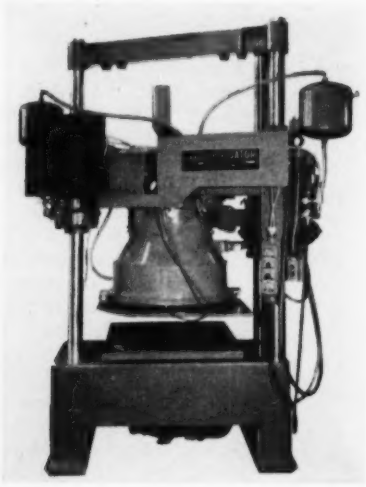


5. Improved Conveyor Systems

Smoother, easier movement of materials, particularly advantageous in conveying of delicate molds and cores, is provided by the Nomad Conveyor line. No shifts, no drops in molds, no sagging or settling of cores. The moving of molds, containers and pallets on rollers, instead of over rollers, is a feature of these systems. Initial cost, installation and maintenance at a minimum. *Westover Engineers.*

6. Laboratory Mixer

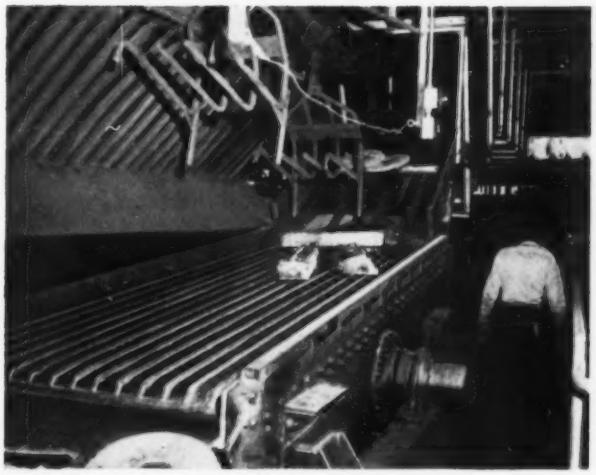
This new LF laboratory mixer is scaled to duplicate production control in the sand testing laboratory. Driven by a 1 h.p. vertical motor, the unit has a 24-inch pan and a rated batch capacity of 50 pounds of material. Furnished with motor, starter supporting base, additional funnel, crib and muller scrapers and dust-tight hood. Many other outstanding features. *National Engineering Co.*



7. Core Blower for Large Jobs

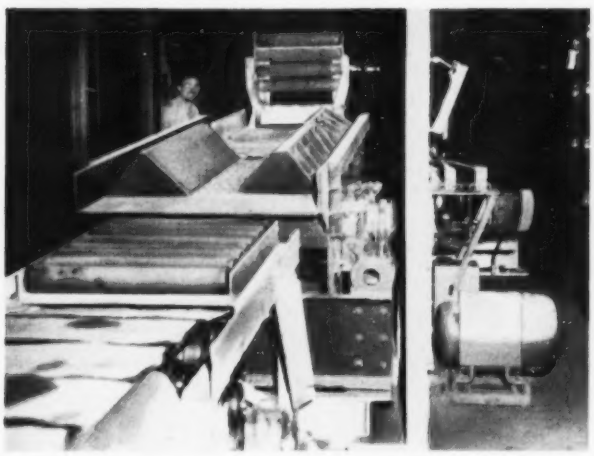
A new "Pulsator" model SAN-BLO core blower for cores up to 250 pounds has recently been marketed. It will blow cores from 5 pounds to the maximum in wood and metal core boxes without changing standard sand magazine. Operation completely automatic, electrically timed. Sand magazine refilled automatically. Use of roller conveyors permitted. *Federal Foundry Supply Co.*

THIRTY-ONE SIMPLICITY SHAKEOUTS AND OTHER UNITS IN FORD'S NEW CLEVELAND FOUNDRY



One of the many Simplicity shakeouts running on production at the Cleveland foundry is this 4'x10' Model D used to remove cores from heads. The castings are handled by a self-unloading overhead cooling conveyor. Three head castings can be seen just coming on the deck of the shakeout, which is running continuously, while two flywheel castings are just being discharged from the conveyor.

Side view of two 3'x6' Simplicity block knockouts that remove excess shot from motor blocks after they have been shot-blasted. The double step arrangement of the shakeouts allows the blocks to change positions end-for-end to insure removal of all shot from the block. A Model OA-10 Simplicity Feeder can be seen in operation under the shakeout at the left.



This 3'x6' Simplicity unit is used for knocking out cores and excess sand from V-Eight blocks prior to chipping and shot blasting. The special guide rails on the shakeout keep the blocks moving in a straight line. In the background, the automatic loading device can be seen in the raised position.

In this operation, a 3'x6' Model D equipped with special riding rails handles the drag flask sections used for engine block castings. The clean flasks are visible as they are being returned by a powered conveyor to the molding line.

In the new Cleveland, Ohio, foundry, the Ford Motor Company has sought and achieved peak efficiency in the production of component castings for Ford passenger car and truck engines. Simplicity equipment, like the units in daily use in this fine new foundry, can help you get better castings faster. There's Simplicity equipment for practically every phase of foundry operation . . . shakeouts, feeders, conveyors, and crushers. Why not write us today here at Durand or get in touch with a Simplicity sales representative and get all the facts.

126

Sales representatives in all parts of the U.S.A.

FOR CANADA: Canadian Bridge Engineering Company, Ltd., Walkerville, Ontario

FOR EXPORT: Brown and Sites, 50 Church Street, New York 7, N.Y.

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(SHOT AND GRIT)

FOR BETTER CLEANING

"We have found that the finish obtained on our steel castings is much to be preferred to that obtained from ordinary shot."*

*West Michigan Steel Foundry Co., Muskegon, Mich.

Malleabrasive cleans better, gives a brighter finish to your castings. That's because it's made by an exclusive process, laboratory tested and controlled to meet exacting standards. Malleabrasive does the toughest cleaning jobs . . . provides the right finish for galvanizing and other coatings.

FOR FASTER CLEANING

"Malleabrasive not only gave a very satisfactory finish but actually cleaned 12.4% more tonnage per hour."*

*Ohio Brass Co., Mansfield, Ohio

Malleabrasive produces more clean castings in a given time because it cleans quickly and results in less down-time. Easier on machine parts and longer wearing, Malleabrasive cuts your maintenance time for parts repairs and refilling abrasive . . . speeds up production.

FOR CHEAPER CLEANING

"Our shot cost per ton cleaned has been reduced over 45% and our replacement parts cost has been reduced 70%."*

*Brewer-Titchener Corp., Cortland, N. Y.

Malleabrasive gives you the lowest overall cleaning costs you've ever had. Down-time is reduced, parts replacements are fewer, Malleabrasive lasts 2 to 4 times longer, and more tonnage is cleaned — no wonder progressive foundrymen everywhere always specify Malleabrasive!

AND PANGBORN can prove these claims! Pangborn will test Malleabrasive in your plant for 30 days, *at no cost to you.* Your work schedule will continue uninterrupted while this test is being run. After 30 days you'll see for yourself that our claims for Malleabrasive are true. Let Pangborn engineers run this impartial test in *your* shop! For more information, write to: PANGBORN CORPORATION, 1300 Pangborn Boulevard, Hagerstown, Maryland.

Malleabrasive Guarantees Lower Cleaning Costs and Better Cleaning Jobs Than Any Other Abrasive!

Packed in orange striped 100-pound bags

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

Pangborn

*U.S. Patent # 2184926 (other patents pending)

BLAST CLEANS CHEAPER with the right equipment for every job

Products Parade

CONVENIENT FORM FOR ORDERING INFORMATION

The prepaid postcard on this page is your handy order form for requesting further, complete information on any of the items listed in PRODUCTS PARADE. Merely circle the number of the item and enter your name and address.

9. Immersion Thermocouple

A product designed to measure temperatures of non-ferrous metals in the furnace or ladle is the Marshall Enclosed-Tip Thermocouple, consisting of an alloy extension tube, aluminum alloy handle, replaceable hot junction tip, with lead wires for attaching the unit to the binding posts of the indicator. Made in two types, one is for measuring molten metals in the furnace, the other for measuring in the ladle. The Thermocouples are suited for molten brass, bronze, aluminum and magnesium. Prompt temperature report, extreme ruggedness. *Marshall Co.*

10. Casting Core Oil

A grade of Penolyn Core Oil is available for every type of casting, to meet most exacting requirements of all foundry and core room operations. Manufacturer claims these important features: uniformity, concentrated form, no bad odor, no seepage, no crusting or green mix, clean working conditions, wide temperature range, polymerized formulation, minimum gas, and ample collapsibility. Write for complete information. *Penola Oil Co.*

11. Cuprex Blocks

For maximum density and minimum gas content in castings of copper or nickel based alloys, Cuprex Blocks, added at beginning of the heat, maintain oxidizing condition during entire melting operation, effectively de-gas and clean molten metal. Other types of these Blocks are used to develop scavenging gases instead of oxygen for yellow brass and phosphor bronze. Blocks weigh 8 ounces and no weighing is needed. The oxidizing melting blocks are also available in powder form where blocks cannot easily be used. Manufacturer also says all these FOSECO products clean and protect the molten alloy and either reduce or entirely eliminate smog formation. *Foundry Services, Inc.*

12. Furnace Fire Extinguisher

Borin Trichloride, an effective extinguisher of magnesium fires in heat treating, preheating and annealing furnaces, is manufactured and sold by Stauffer. This material is clean, easy to handle and is your best insurance against costly magnesium furnace fire damage. A valuable item to have available in your foundry operations. Further information on this product available upon request. *Stauffer Chemical Co.*

Reader Service Dept.

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51. Basic Metals and Alloys

Chart showing range of compositions of 40 elementary metals and 8 elementary metalloids considered most useful in industry, divides these elements into 10 major classes and 60 subclasses, arranged in sequence according to atomic numbers. Specific gravity of each element has been inserted. *Sam Tour & Co., Inc.*

52. Car Spotters and Pullers

Booklet (No. 2092) describes equipment for moving railroad cars and other heavy loads, lists 18 single-drum car pullers. Includes instructions for calculating rope pulls required for moving railroad cars—with such variables as track curvature, grades, and temperature considered. Layouts show correct positioning of machines in variety of applications. *Link-Belt Co.*

53. Calcium Carbide Injection

Reprint of 18-page article from *The Iron Worker*, booklet (ADR 81) traces new metallurgical process for treating metals in the molten state through progressive stages of development. Text is supplemented with diagrams, photographs, test curves and tables. *Air Reduction Sales Co.*

54. Measuring Sand and Mold Properties

Reprint (AF7) of an AMERICAN FOUNDRYMAN paper by Clyde A. Sanders and Arthur G. Clem, both of American Colloid Co., Chicago, on how the one-to-ten ram test measures sand and mold properties. Chart changes in mechanical properties of sand mixtures when compacted and correlates findings with practical molding operations. *American Colloid Co.*

55. Dust Collection

Folder lists and illustrates 16 variations of equipment, each designed for some particular difficult dust collection job. Explains how wide range of designs permits tailoring a dust-collection system to meet specific needs. *American Air Filter Co.*

56. Plate Magnet Separators

Brochure (No. B-603) describes permanent, non-electric, Model C plate magnets designed for all but heaviest tramp-iron removal problems. Separators are not affected by water or by temperatures up to 650 F. They trap and hold tramp iron in material flows up to 2 in. in depth, are expressly designed for installation in wood spouts, chutes, hoppers, feed tables and for suspended application above slow-moving conveyor lines. *Eriez Manufacturing Co.*

57. Non-Skid Floor Surface

Technical data bulletin (62-B) describes new crystalline mineral and its application to form unusually hard, resilient, non-skid floor surface. Designed for easy application to old floor surfaces, material is said to compress into increasingly harder, smoother surface under heavy loads and hard wear. *The Monroe Co., Inc.*

58. Air Weight Control

Data sheet (330-6) describes air-weight control system which incorporates new compensator to eliminate effects of blower pulsations on cupola control. New unit has snubbing device which damps out throbbing effect even when positive displacement blowers are installed on the blast lines. Provides accurate, sensitive control of air flow, automatically correcting rate for variations in atmospheric temperature and pressure. *The Foxboro Co.*

continued on page 187

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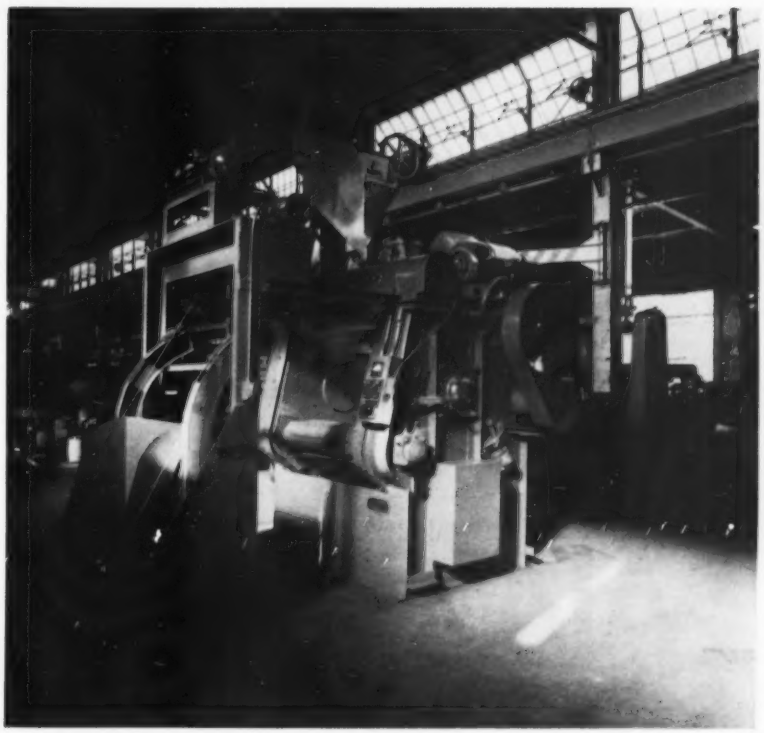
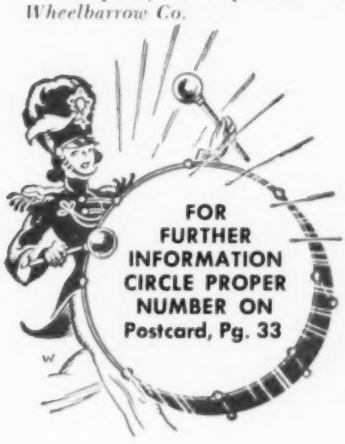
8. Modernized Blast Cleaning Barrel

Here is a versatile piece of foundry equipment that can help you get more efficient, faster, and more economical blast cleaning in your shop. Featuring the ROTO-BLAST process, these Blastmaster barrels, according to the manufacturer, save labor through push-button operation, conserve space with ultimate compactness, save time by cleaning more loads per day, eliminate compressors, and do not require use of tools because all scale is removed. Abrasive-tight door rolls up compactly when door is opened. Automatic throw-out torque arm disengages barrel drive in case of jams. Work conveyor take-up on bottom shaft is easier to adjust. Work conveyor with hardened steel chain will not clog. Blastmaster Barrel now available in 3, 6, 12 and 18 cu. ft. capacity. *Pangborn Corp.*

9. Heavy-Duty Casting Truck

This convenient foundry tool is adjustable to accommodate discharge door, and has extra-heavy flange reinforcement at top and bottom to prolong truck life. All-steel welded body reinforced by three heavy steel cross braces and one longitudinal brace, welded to sill and box. Provided with ball bearing swivel casters on one end for easy maneuverability. Maximum rated capacity: 2,000 pounds. *Sterling Wheelbarrow Co.*





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AJAX TAMA-WYATT *Induction Furnaces*—

Thousands of die cast rotors for hermetic motors are made from pure aluminum poured from a battery of AJAX Electric Induction Furnaces installed in the St. Louis plant of the Emerson Electric Mfg. Co. Two of these furnaces are shown in the photograph at right.

Close-up of die-cast aluminum rotor which is pressed onto the compressor shaft extension used in refrigeration units.

Our electrical industry produces fractional horse power motors at the rate of 20 to 25 millions per year. After World War II the leading manufacturers changed from fabricated copper rotors to cast aluminum rotors. In this operation, aluminum of high purity under closely controlled temperature is required.

In many cases the machines had to be placed right on the assembly line, with severe space restrictions and, of course, rigid requirements for reliability. AJAX induction furnaces and AJAX automatic pouring units were selected for this job in almost all the plants which switched from copper to aluminum rotors.

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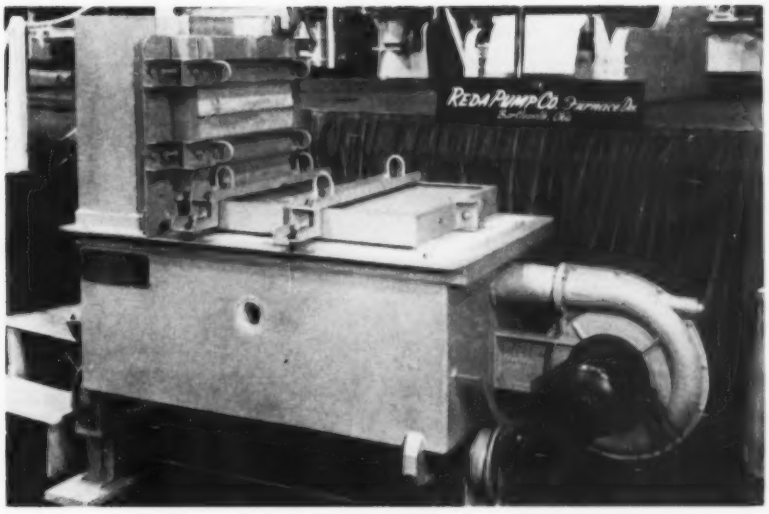
AJAX ELECTRIC CO., INC., The Ajax Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

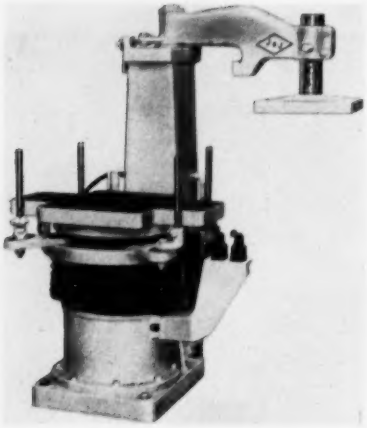


13. Reflecting Type Furnace

This highly efficient, gas or oil fired, stack loading, reflecting type furnace for melting ferrous and non-ferrous alloys is ideal for jobbing foundries. Requiring but little space, it can increase output several times over other types of melting equipment of comparable charging capacity. Continuous pour operation saves time. Models available in 400, 550, and 1000 pound capacities. Larger models on order. *Reda Pump Co.*

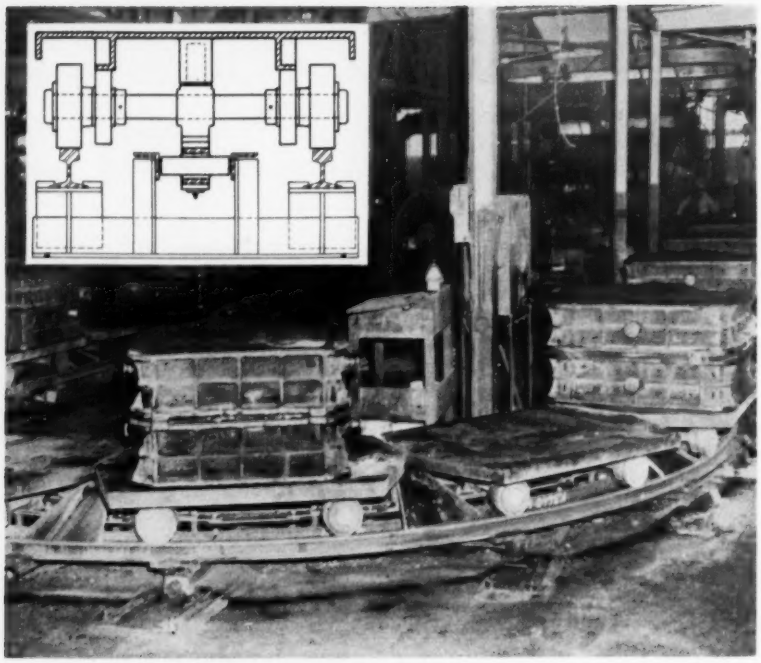
14. Economical New Carscoop

Transport of castings in a foundry is quick and economical with this new model 102 Carscoop. Split-second control and reverse by foot lever, no clutching, no gears to shift. Time saved per trip means more trips per day with less operator fatigue, greater efficiency in performance. Carscoop has short turning radius of only 6 ft 3 in., making it an ideal foundry tool for close-quarter work and in box-car unloading. Top speed of the vehicle is 11 miles per hour, which reduces lost time on long hauls. Full information upon request. Ask for Bulletin 250-B. *Butler Bin Co.*



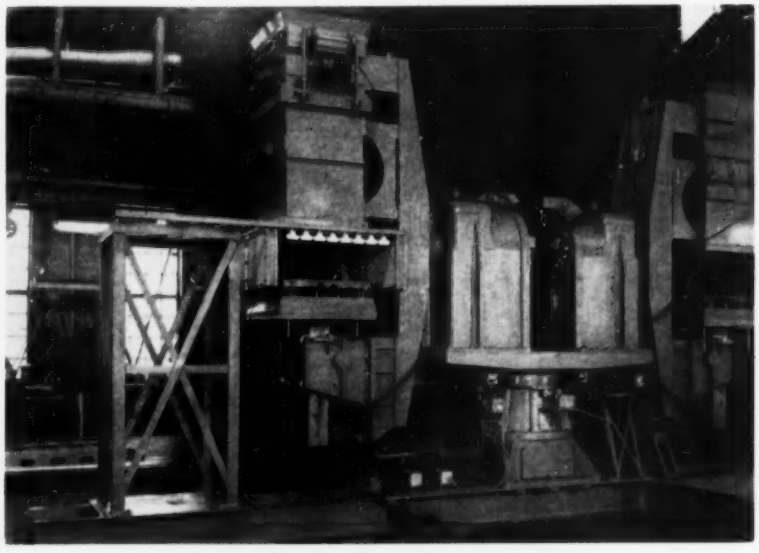
15. Improved Molding Machine

Exclusive concentric draw design with single large-diameter, concentric draw cylinder makes this Jolt Squeeze Pin-Lift Molding Machine extremely fast, and provides the most accurate draw obtainable with this type of machine. Internally ported jolt cylinder on model 513-6, with knee-valve control for the jolt and a single hand-valve control for the squeeze and draw. Two convenient pilot valves control all operations on the illustrated 716-8, including air-actuated swinghead. Quickly adjustable squeeze platen for different height flasks, and lift pins adjustable for wide range of flask sizes. 513-6 has full 6-in. draw and 650 pound jolt capacity. 716-8 provides full 8-in. draw and 1500 pound jolt capacity. Jolt guide pins work in hardened and ground steel bushings. *Beardsley & Piper.*



16. Car-Type Mold Conveyor

This Link-Belt Tru-Trac Car-Type Mold Conveyor is used to convey castings weighing up to 500 pounds from molding stations, through pouring and cooling, to shakeout. Cross-section line drawing shows how top plate is supported by rollers on car axle, assuring true-tracking at all times. Car wheels are positioned on T-rail tracks by conveyor chain operating within angle guides. Sloping spill plates between cars protect conveyor chain and car tracks from spillage of molding sand or hot metal. *Link-Belt Co.*



17. Flexible Shell Molding Equipment

A complete line of shell molding equipment in sizes and types to meet particular production requirements. Pattern plate sizes from 12" x 18" to 30" x 40" flexibly accommodated. Machines of single or multiple head types, shuttle type, rotary index, continuous rotary. Extreme flexibility of equipment enables you to gradually get into shell mold production. Start with single head simple machine and add standard interchangeable package units. Other exclusive features: unit sand-resin addition, dual continuous curing, sand resin rainfall, lump scavenging, precise time-temperature control. *Winter Engineering Corp.*

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- **MEXADIP WILL NOT FERMENT.** You will not have to dump your wash because of hot humid conditions—no pock marks or pitted coating surfaces with MEXADIP.

- **MEXADIP STAYS IN SUSPENSION.** Let it stand over the week end, it will be ready to go Monday morning.

- **MEXADIP WILL NOT RUN, BUILD UP OR RUB OFF.** It applies equally well on either green or baked cores.

- **MEXADIP IS DEPENDABLE AT ANY BAUME.** It is applied daily to cores for thousands of tons of castings over a range of 10-40 degrees Baume.

- **MEXADIP REQUIRES NO LONG "PASTE" MIXING.** No waiting period is necessary. Just add the powder to water and after a few minutes of stirring it is ready to go.

IMPROVE CASTING APPEARANCE AND SAVE MAN HOURS IN THE CLEANING ROOM. If you have a problem with core wash, MEXADIP will solve it. Ask us to arrange a test today.

Why wait . . .
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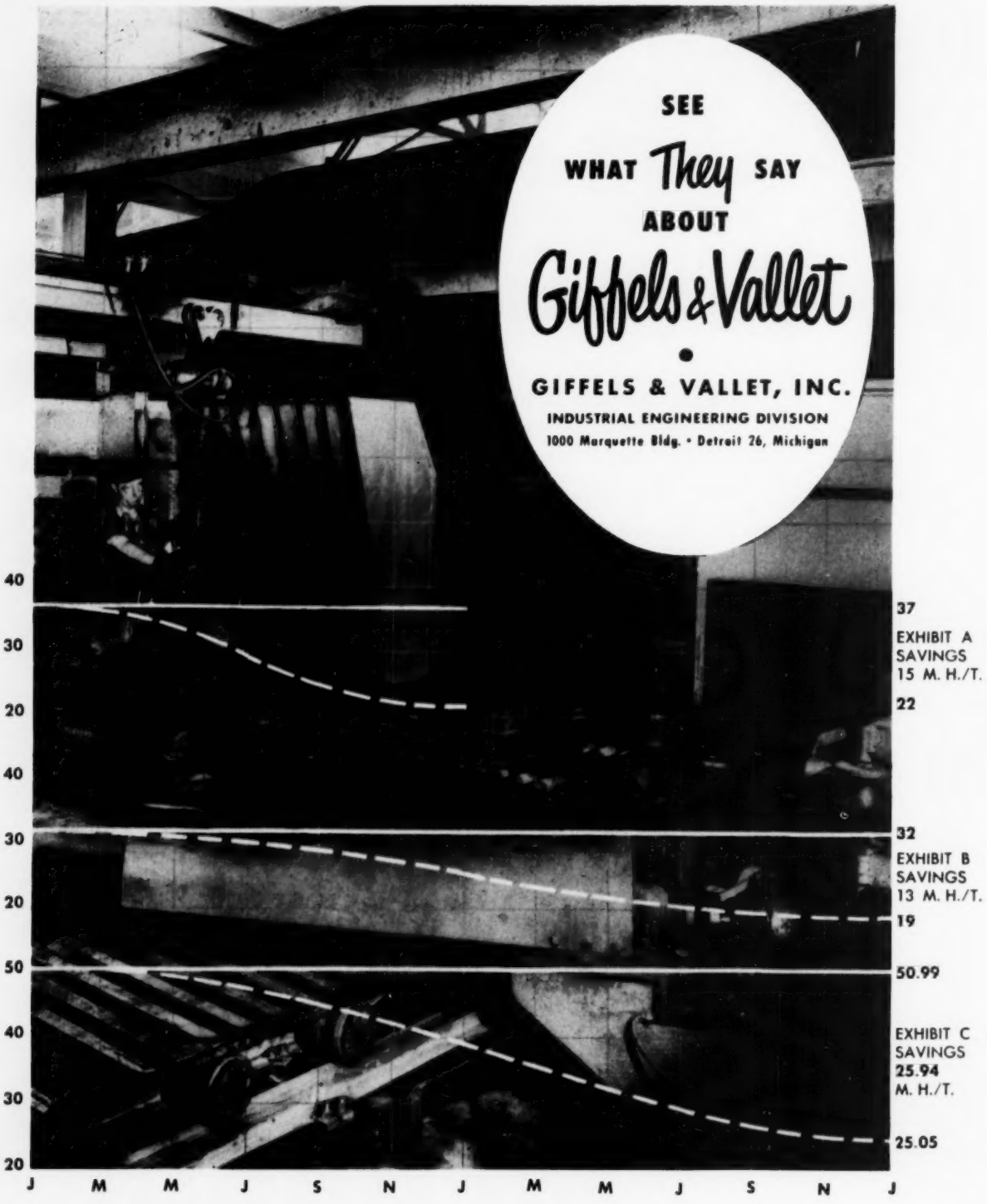
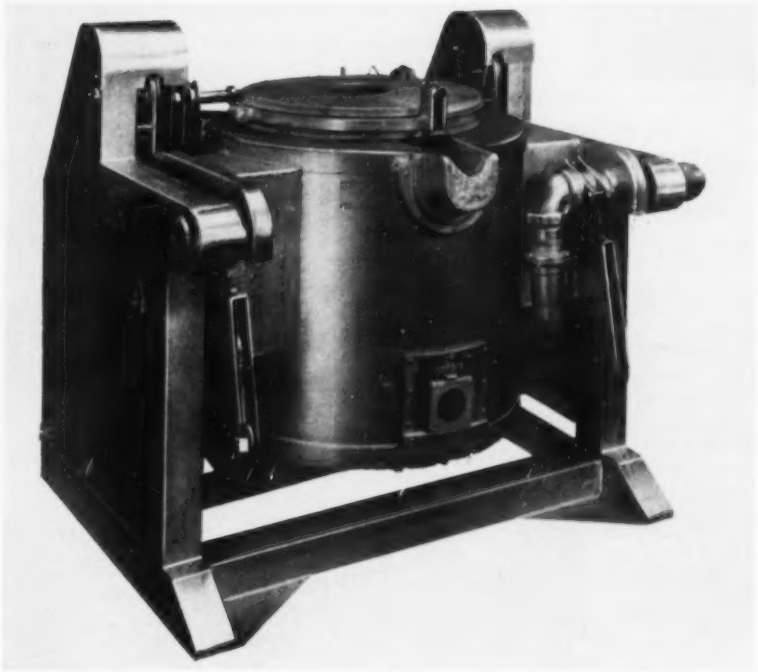


THREE ACTUAL EXAMPLES OF SAVINGS IN MAN HOURS PER TON IN A STEEL CASTINGS CLEANING ROOM AND IN AUTOMOTIVE GREY IRON CASTINGS

Names of these firms upon request

18. Testing Sand Cores ➡

Using a newly developed phenolic type synthetic resin to bind the sand cores, this lab technician is testing a method of making foundry sand cores. Organization is also producing new resins for shell molding. *Reichold Chemicals, Inc.*



19. Gas or Oil Furnace Crucible

This type MNP gas or oil fired furnace crucible, for non-ferrous metals is nose pouring, motor tilting. Crucible sizes number 150-1000. Information on this equipment and a complete line of melting furnaces and holding units available in new Bulletin 551. *Lindberg Engineering Co.*

20. High Quality Silica Sand

You will have better castings with fewer rejects and lower cleaning costs by using the highest quality sand. PENN-SAND combines lower confined expansion and higher permeability, says manufacturer. Produced in various A.F.S. fineness numbers. *Pennsylvania Glass Sand Corp.*

21. Blacking for Core and Mold Washes

Workman is using Diamond Blacking, the result of over half-century of research and development. Intended for use as both core and mold washes, it is said to provide better surface with fewer flaws. Available already prepared, requiring only addition of water. Can be brushed, sprayed or dipped. *Asbury Graphite Mills, Inc.*

22. High Frequency Grinder

The 360-cycle high frequency electric grinder shown is a favorite with foundrymen. This G37 model is a powerful, 6000 r.p.m., portable weighing only 8½ pounds and 17½ in. in length. Other 360-cycle grinders available with speeds of 8000, 9500, and 12,000 r.p.m. Manufacturer also produces over 100 types of high frequency, pneumatic and universal electric grinders. *Thor Power Tool Co.* (formerly Independent Pneumatic Tool Co.).

Illustration shows cope and drag set on fender pattern for STAR PATTERN & MFG. CO., Benton Harbor, Mich.

for Higher Casting Production...

look to **ACCURATE** cope and drag sets

Because they have been a profit maker for several hundred of the leading foundries all over America...

For example, when you use Accurate cope and drag sets you get clean smooth partings. Patterns as cast are straightened and have correct alignment marks. This helps to decrease your finishing costs.

Maintenance costs are much lower because you get longer life..

Wherever used, Accurate cope and drag sets have been the means of producing greater volume of castings at lower costs.

Why not apply this idea to your foundry? It has been profitable to others and will be to you, too.

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BUCKEYE CONTINUES TO DEVELOP AND IMPROVE PARTINGS AND FOUNDRY SUPPLIES

Photo taken in Peerless Foundry Co. Elmwood Place, Ohio

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New, Improved PARLEX

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Where *dry* parting is indicated, we recommend our

AVON (white) ***Non Silica Parting***

vastly superior to all previous partings of this type.

ONE of our recent laboratory developments — and intended primarily for use as a parting agent in sandslinger operations — *Slinger-slick* will part equally well when sprayed, swabbed or brushed on all types of molding processes: roll overs, squeezers, etc. A base liquid parting, *Slinger-slick* is *unusually economical.* Just add kerosene or other solvent. Saves on material . . . Saves on freight...Non-inflammable...Not affected by cold... Will not settle out...Guarantees clean parting, smooth molds. Usually packed in 55 gal. drums. Write on your letterhead for—

1 Gal. Sample FREE. Prove it at our expense. Write today!

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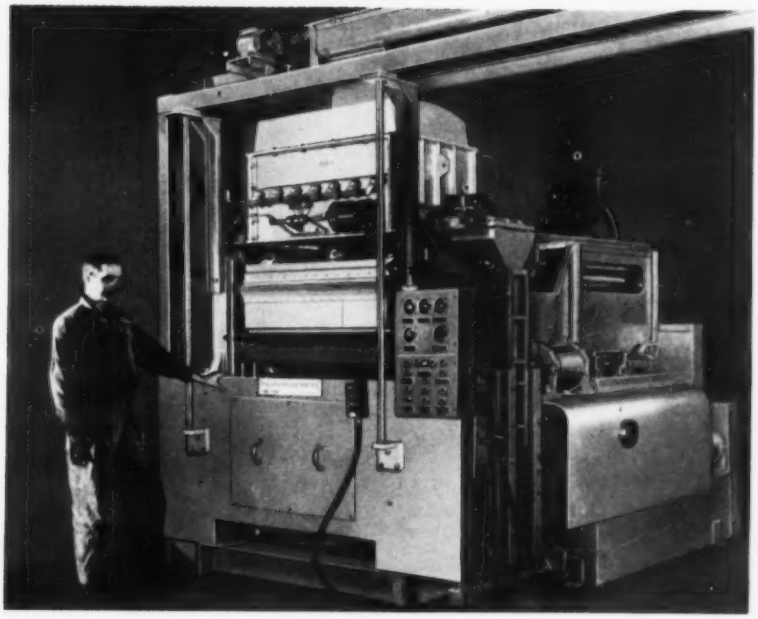
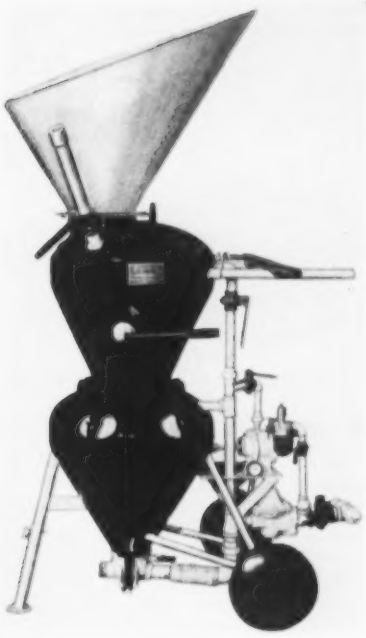
Phone 3-2474
Lancaster Foundry Supply Co.



23. Automatic Shellmolding Unit

Based on this standard model SU-1 high-production automatic molding unit, mechanization of all phases of shellmolding operations is possible with this line of equipment. The SU-1 is equipped with automatic-metering sand-resin-mix recharge feeder. Other auxiliary units completing mechanization of new process, available for use with SU-1 machine, include blending and conveying equipment, mold-removal units, mold-straightening and mold-closing presses. *Shellmold & Machine Co., Inc.*

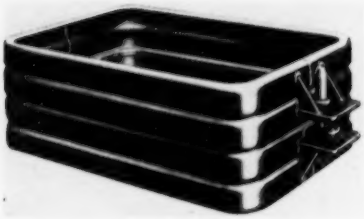


24. New Blastcrete Gun

This new model PM-1 Blastcrete Gun provides easier, faster loading, better control of material flow and air pressure, and meets ASME Code for pressure vessels. Easy feed flow and cutoff control. Places 1 to 5 cu yds per hour. Handles all cementitious and refractory materials. Illustrated brochure and specifications available. *Blastcrete Eqpt. Co.*

25. Graphite Dispersion

"Dag" Colloidal Graphite Dispersions, sprayed or brushed on chills, patterns and permanent molds, as shown here, improve foundry efficiency and general working conditions. Send for full information. *Acheson Colloids Co.*



26. Fabricated Steel Flasks

This lightweight Style FP-14 flask is designed to eliminate handling problems while retaining strength and rigidity required under all conditions involving the use of small flasks. A style FP-22R flask, by the same manufacturer, is a heavy-duty model. A full line of flask accessories is also marketed. *Black, Sivalls & Bryson, Inc.*

27. Chill Nails

Three special types of fine chill nails are offered by Fanner for better, sounder castings. Better surfaces for molten metal to contact, more chilling volume per pound. *Fanner Manufacturing Co.*

28. Crucible Pouring Device

Illustration shows a Model E. Pouring Device being used for handling red-hot crucibles. Through addition of an intermediate gear, the hand wheel is projected closer to steadying operator. This adaptation of the standard device, for crucible pouring, allows reversing of load-raising action to permit operator to pull downward on wheel. Manufacturer's complete line of Pouring Devices for all types of ferrous and non-ferrous work is available on request *Modern Equipment Co.*

29. Air Weight Control Unit

A new compensator, now standard in Foxboro's model 40 Air Weight Controller for foundry cupolas, eliminates effects of blower pulsations on control. Manufacturer says uniform combustion through control of air weight is now practical, even where positive displacement blowers are installed on blast lines. Rate of air flow is automatically corrected for variations in atmospheric temperature and pressure. Unique snubbing device also damps out throbbing effect resulting from use of certain types of blowers, permits controller to respond only to true changes. Instrument provides accurate, sensitive control, as attested by its performance in over 1400 foundries throughout the world. The flexible unit is also used for other operations, including smelting furnaces, chemical processes, glass melting and the manufacture of rock wool. Descriptive Data Sheet 330-6 sent on request. *Foxboro Co.*

COUNT 'EM . . .
JUST COUNT 'EM!

TENNESSEE
PRODUCTS & CHEMICAL
Corporation
NASHVILLE, TENNESSEE

It's as simple as 1 and 1. Tennessee Products' ferrosilicon and ferromanganese briquettes contain exact amounts of these ferro alloys. Just count out the required number for your cupola charge. You eliminate time-consuming weighing, and facilitate rigid product control for a faster, more economical foundry operation.

Ferrosilicon is available in lump, sized and powder form as well. TENNESSEE also makes low phosphorous pig iron and high grade malleable pig iron for the metal industries.

For complete details contact Tennessee Products & Chemical Corp., First American National Bank Building, Nashville 3, Tennessee.

So smooth, so firm, so fully packed . . . Your castings are better, for a fact, when you bond with top quality . . .

NATIONAL BENTONITE

Many expert foundrymen have been bonding their molds with consistently high quality National Bentonite for years for making smoother, finer-finish castings . . . fewer rejects. The proper proportion of National Bentonite in their formula means a mixture with good green and hot strength, and minimum mold moisture content, that rams and jolts firmly . . . reducing hazards of blows, gas holes, and other surface defects. That's why they say, "I can rely on National Bentonite."

Write, phone or wire today, and let us help you with your bonding problems.

FIRST CHOICE WITH MANY GOOD FOUNDRYMEN FOR YEARS

Quick Service From Better Foundry Suppliers Everywhere

Baroid

Baroid Sales Division ☆ National Lead Company

Bentonite Sales Office: Railway Exchange Building, Chicago 4, Illinois

FINER FINISH

CUTS CLEANING TIME

Several factors in the mold making affect the smoothness of the casting finish . . . sand, bonding agent, moisture, with the proper proportions of each in the mold mix formula.

First, of course, is the base sand. To get the best casting finish, a blend of core sand with the finest possible silica or bank sand is recommended. Coarse sand will result in too much metal penetration, for a coarse finish. Next, build up the sand with the minimum quantity of a bonding agent which will combine the necessary green and hot strength with good flowability characteristics, so that the mixture will ram and jolt firmly around the pattern.

A high quality bentonite is recommended for your bonding agent, since it provides a high green, dry and hot strength as well as good flowability for hard ramming. Soft ramming may also result in metal penetration when the mold is poured with resultant "burn-ins" and other surface defects.

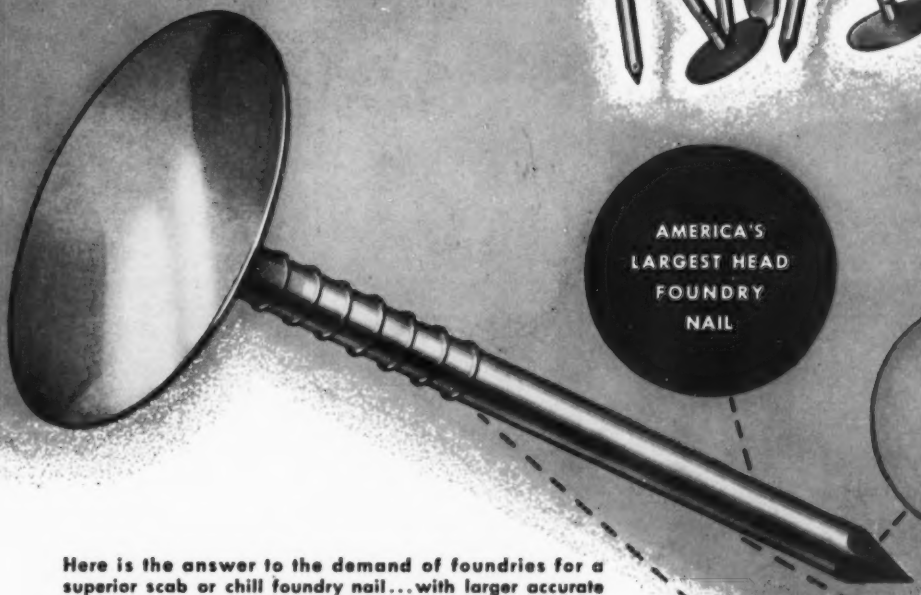
Now, of course, use no more temper water than is necessary for proper sand conditioning. Many of the most common mold defects . . . blows, scabs, burn-ins, pin holes, etc. . . . which mar the surface of the castings can be attributed directly to excessive moisture in the mix.

By keeping the proportion of bentonite as low as possible for the bond strength required, the proper water balance of the mix can be maintained to get the mold properties desired . . . for smoother, finer-finish castings require less time in the cleaning room later.

4112

NOW!

fine FANNER bullhead FOUNDRY NAILS



AMERICA'S LARGEST HEAD FOUNDRY NAIL

BURRLESS DIAMOND POINT for easy, fast handling

MADE BY PATENTED NEW PROCESS

SAVES TIME AND EQUIPMENT
One FANNER nail equals two ordinary nails

Here is the answer to the demand of foundries for a superior scab or chill foundry nail... with larger accurate head size... sturdier construction for better support... and burrless diamond point that saves handling time.

Foundrymen everywhere for years have asked that FANNER produce a better foundry nail—and the new FANNER "Bullhead" nail is the result of specialized experience, new and exclusive machinery, and months of testing. One FANNER "Bullhead" Nail will do the work of two or three ordinary types. They are clean... smooth... strong, easy to pick up and use. Only FANNER could produce a nail that is so exactly suited for many foundry applications. Get FANNER "Bullhead" Nails... compare the difference in quality... and they cost less than similar types.

Available in two types—order them through your foundry supply jobber or write direct.

BULLHEAD FOUNDRY NAILS

SIZES	10 gauge—⅜" HEAD			11 gauge—9/16" HEAD			12 gauge—7/16" HEAD		
LENGTH	¾"	⅞"	1"	1¼"	1½"	1¾"	2"	2½"	3"

LARGE HEAD NAILS

SIZES	9 gauge—½" HEAD				10 gauge—½" HEAD				11 gauge—7/16" HEAD			
LENGTH	⅞"	1"	1¼"	1½"	1¾"	2"	2¼"	2½"	2¾"	3"	4"	5"	6"

THE FANNER MANUFACTURING COMPANY
BROOKSIDE PARK **CLEVELAND 9, OHIO**

designers and manufacturers of fine FANNER CHAPLETS AND CHILLS

Quality control technician testing core sand compression strength in Cleveland Ford Foundry laboratory.

Core sand with a "character"...

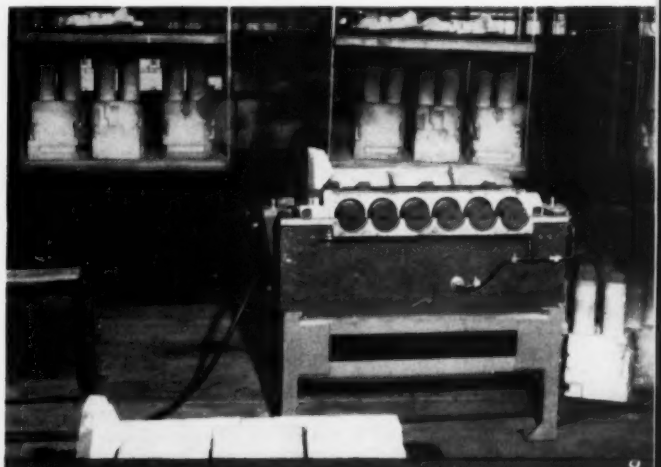
SIMPSON *MIX-MULLERS*®

prepare *ALL CORE SAND*

at

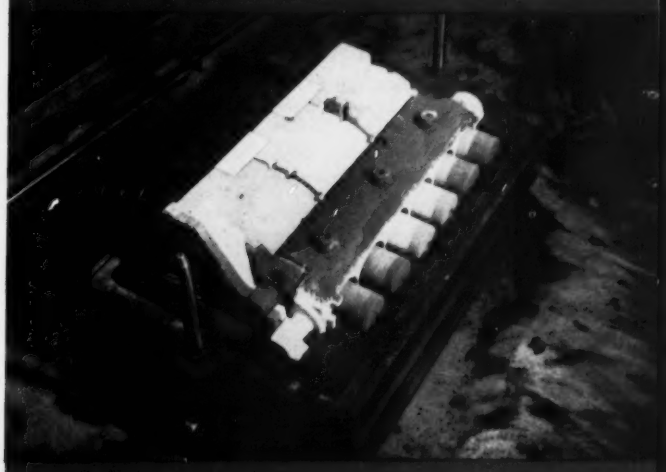
FORD Foundry

View shows only a small part of the huge (15,000 sq. ft.) core storage and handling facilities at the Ford Foundry.

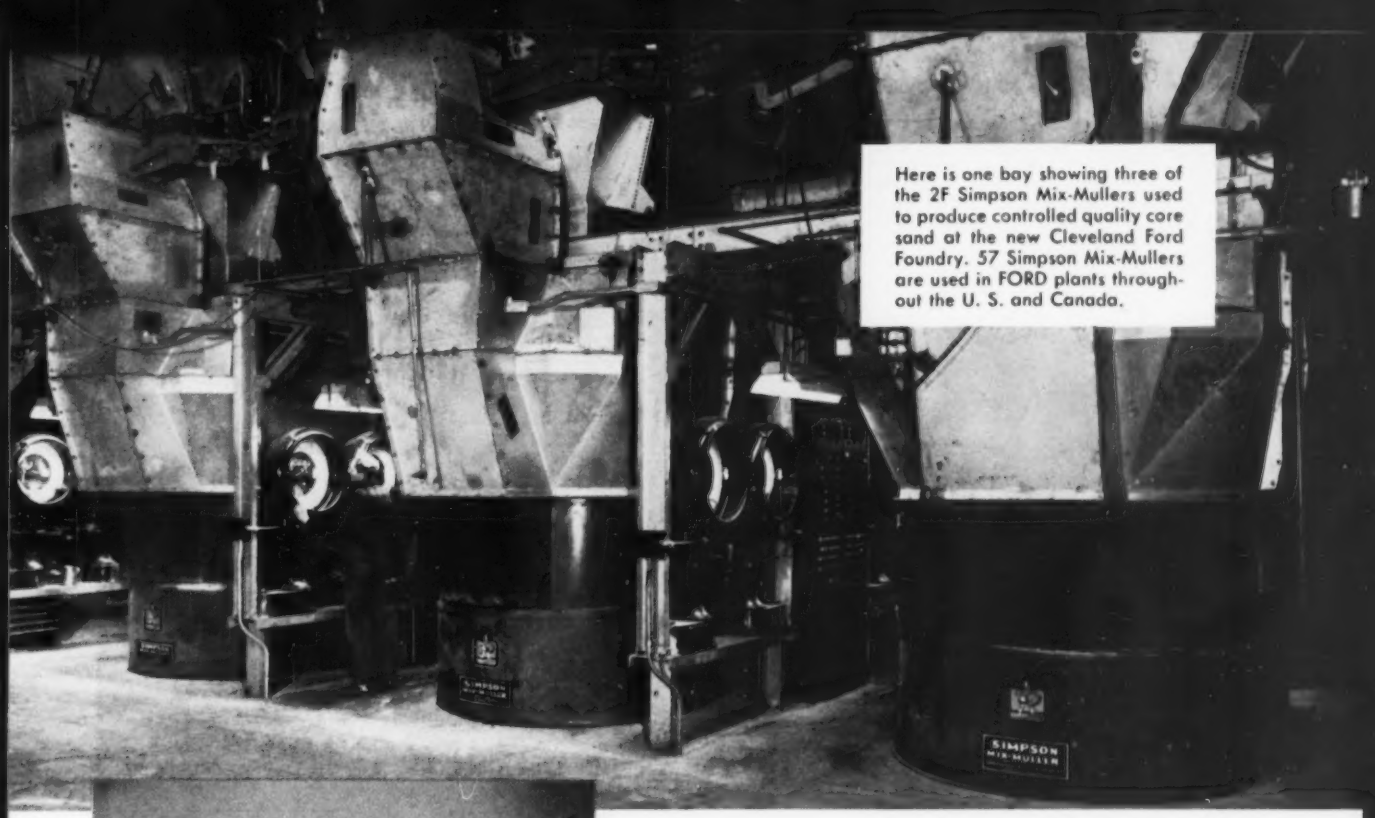


Specially-designed facilities speed core and block assemblies at the Cleveland plant.

Another view showing seven engine block molds with cores in position.



Close-up view showing the extensive use of cores in the engine block casting.



Here is one bay showing three of the 2F Simpson Mix-Mullers used to produce controlled quality core sand at the new Cleveland Ford Foundry. 57 Simpson Mix-Mullers are used in FORD plants throughout the U. S. and Canada.

"*Quality is the key for '53*" . . . Signs bearing these words are very much in evidence in the large, modern foundry serving Ford Motor Company's all-new Cleveland Engine Plant.

To successfully mass produce the new FORD 6 high-compression engine block in large quantities . . . to rigidly maintain required tolerances and smooth finish on interior surfaces . . . particular care must be given to the preparation of the seven intricate cores used in the block. (See illustration at lower right—opposite.) *All core sand is prepared in SIMPSON MIX-MULLERS.*

By minimizing the amount and number of ingredients in the core mix . . . by laboratory and spot testing all sand six different times from storeroom to core oven . . . Ford engineers are able to maintain core tolerance to the *exact size of the core box.* Tests for moisture and oil content and green strength (which run as high as 2.0 on some formulations) are made on each batch of Simpson-mulled sand. A particular *character* . . . or plastic quality, is imparted and maintained in the sands, to assure accuracy to pattern and density of strength. Simply stated, Ford is getting *big* results through careful attention to *little* details of sand control.

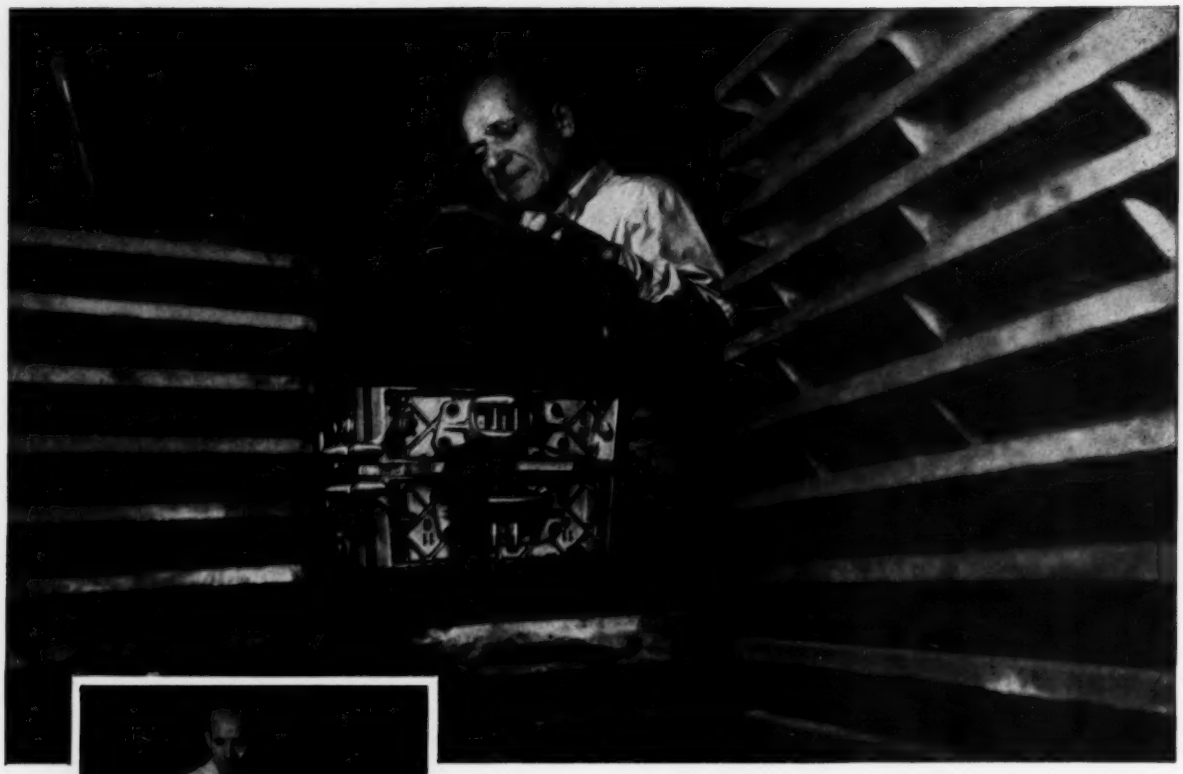
Hundreds of leading foundries producing for the automotive industry rely on Simpson Mix-Mullers to help impart the particular *character* necessary to the sand used in their operation. This "character" or controllable quality of Simpson-mulled sand is a *tool* and is as useful and usable as your sand laboratory towards the production of castings to your specifications.

Let our engineers show you why SIMPSON MIX-MULLERS are called . . . *The Product of a Practical Foundryman* . . . write for Bulletin 511.

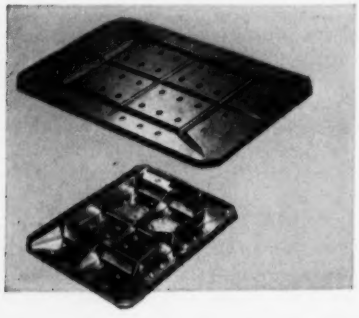
SIMPSON
Intensive
MIX-MULLERS

National Engineering Company
(Not Inc.)
900 Machinery Hall Bldg. • Chicago 6, Illinois

Manufacturers and Selling Agents: For Continental European Countries — George Fisher, Ltd., Schaffhausen, Switzerland; for British Possessions — August's Limited, Halifax, England; for Canada — Dominion Engineering Co., Ltd., Montreal; for Australia and New Zealand — Gibson, Battle & Co., Pty., Ltd., Sydney. for Argentina, Brazil and Uruguay — Equipamentos Industriais EISA Ltda., Sao Paulo, Brazil; for Mexico — CASCO ,S. De R.L., Mexico, D.F.



Molder finds EDCO Dowmetal Bottom Boards are light, easy to handle and stack.



"We cut our board losses from 7500 down to 12 . . . by switching to EDCO Dowmetal Bottom Boards"

— *says R. D. BAYSINGER, Manager, Foundry Division*
GREENLEE BROS. & CO., ROCKFORD, ILLINOIS

Analysis of five-year records at the Foundry Division of Greenlee Bros. & Co. revealed a loss of only 12 Edco Dowmetal Bottom Boards, in contrast to a normal loss of 7500 wood boards during the same period of time.

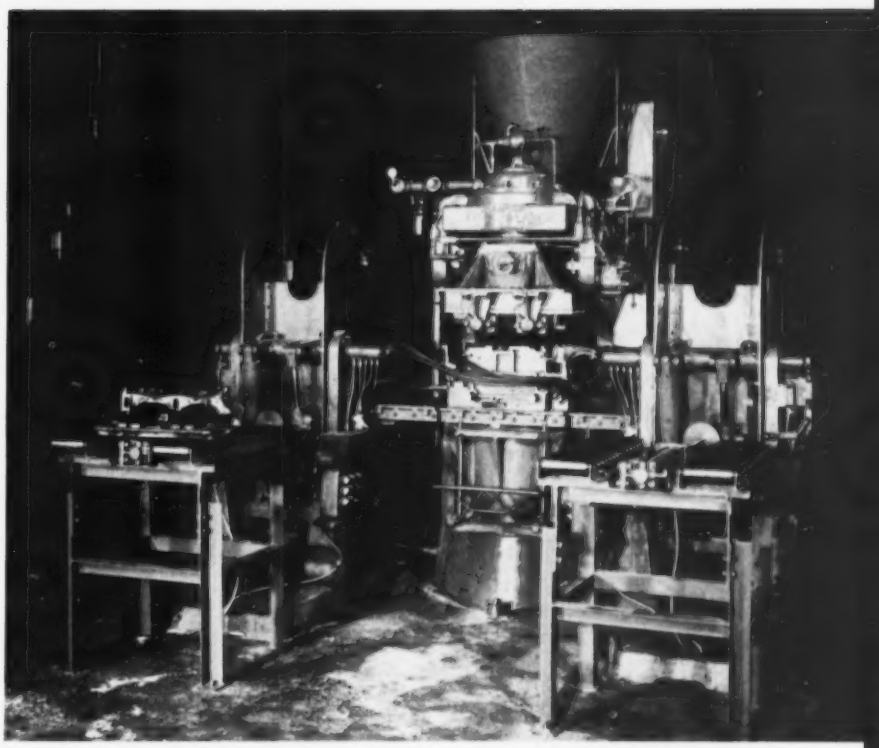
"Further," says Baysinger, "we estimate *our scrap loss has been cut 20% since switching to Edco.*" Benefits like these are typical. For example, another Edco user commented, "Our old wood boards had a life of about two weeks; and toward the end of their life-span, they always produced some poor castings which had to be rejected." Edco Dowmetal Bottom Boards are different: they stand up under constant use . . . and keep casting quality up, too.

Add to this the fact they are light, easy to handle—stack in small space, easily and securely—and you'll see why it's "good business" to switch to Edco.

Write us, or phone CApitol 7-2060 for price schedule and list of 78 standard sizes available from stock.

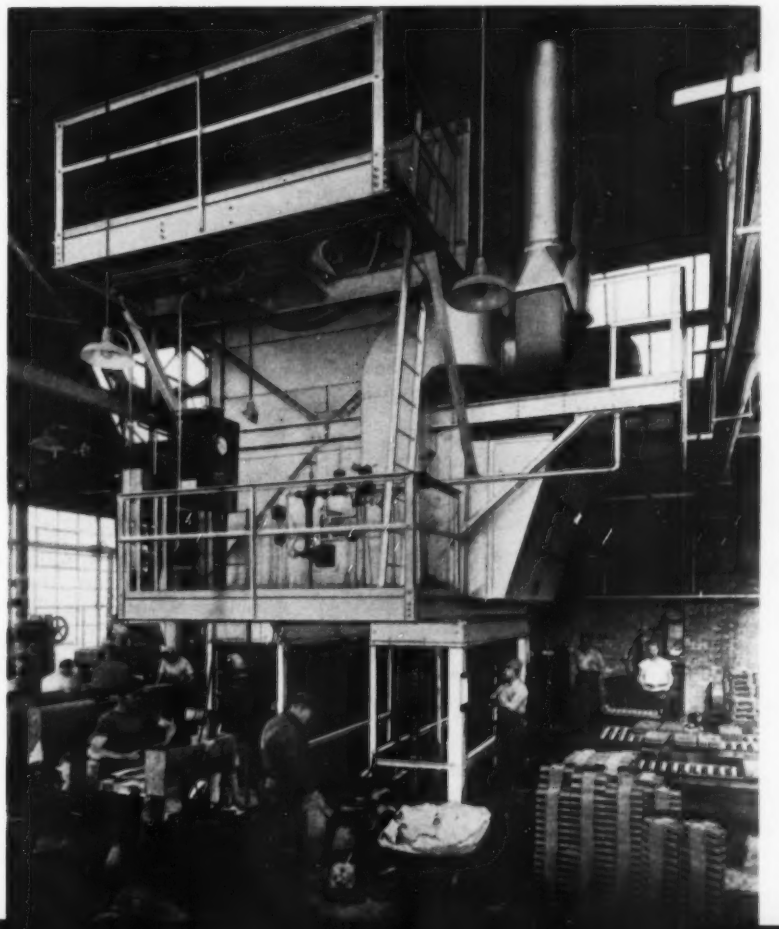
CHRISTIANSEN CORPORATION

1521 NORTH KILPATRICK AVE.
CHICAGO 51, ILLINOIS
ALUMINUM ALLOY INGOTS
ZINC BASE DIE CASTING ALLOYS



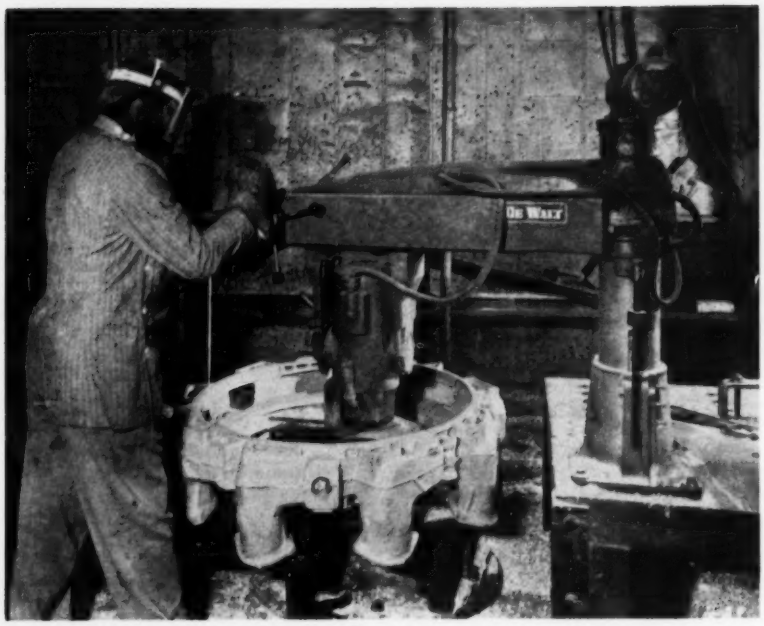
30. Core Blower-Roll Over ➡

This new Champion Dual-Cormatic Unit permits a complete core to be blown, drawn, and rolled over automatically every 11 seconds. A single operator controls the Core Blower and both Rol-A-Cor Units. Using Rol-A-Cor Units alternately, operator is able to work at high degree of efficiency with minimum lost motion. He need only place core dryers on cores as they are blown and remove completed cores. All other operations are automatic. Single and Dual-Cormatic units are manufactured for wide range of requirements in high production core rooms making highly repetitive work. *Beardsley & Piper.*



⬅ 31. Tower Oven

Eliminating racks, trucks and aisleways, this Coleman Tower Oven permits up to 75% saving in floor space. Provides accurate temperature control and uniform heat distribution for perfect core baking with any binder. Large and small cores can be baked together. Many outstanding features. *Foundry Equipment Co.*

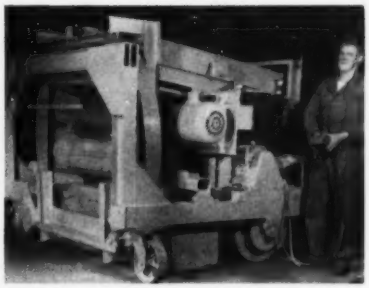


32. High Speed Friction Saw

DoAll's Zephyr, pictured above, is a high production tool for the modern foundry, featuring extreme flexibility. The machine has a very large work capacity and an infinitely variable speed control, making it the foundryman's friend. This type saw is particularly ideal for cutting gates and risers from castings and for cutting sheet metals and structural forms such as tubing and beams. Frictional heat generated by saw band teeth raises temperature of material ahead of saw band to approximately forging temperatures, making it soft and relatively plastic. *DoALL Co.*

33. Foundry Cutting Machine

This model ME-2F Cutting Machine is a versatile, multi-purpose unit for cutting gates and risers from castings of ferrous and non-ferrous metals and alloys. Designed specifically to meet foundry needs, the ME-2F features flexible operation, sturdy construction and simplified design. A 360° adjustment provides fast and accurate cutting. *De Walt, Inc.*



34. Foundry Sand Conditioner

The Model C. Ringlift self-propelled, self-loading Sand Conditioner illustrated is specially designed for applications where shakeout sand has a very high dry strength, where starting space is limited, or where high screening capacity is needed in a compact unit. Model C-36 shown has 3 x 6 ft gyratory screen overall length of 84 in. *States Engineering.*

Can you beat this for low maintenance?

Neenah Foundry Company of Neenah, Wisconsin, has been using three Cleco Edge Grinders for an average of two years. These tools are used almost continuously for sixteen hours per day, cutting flash from castings.

Recently, all three grinders were given a routine overhaul. For two of the tools, this was the first repair of any kind. The other grinder had previously required one minimum repair job.

Considering the severe usage, both Neenah Foundry Company and our distributor, The General Rubber Company of Milwaukee, feel that the service given by these grinders is outstanding.

Service like this is an important reason why Cleco Air Tools are preferred by foundries. Ask your distributor or write us for full information.

CLECO AIR TOOLS — DALLETT

CLECO DIVISION

of the REED ROLLER BIT COMPANY, 5125 Clinton Drive, Houston 20, Texas, U.S.A.

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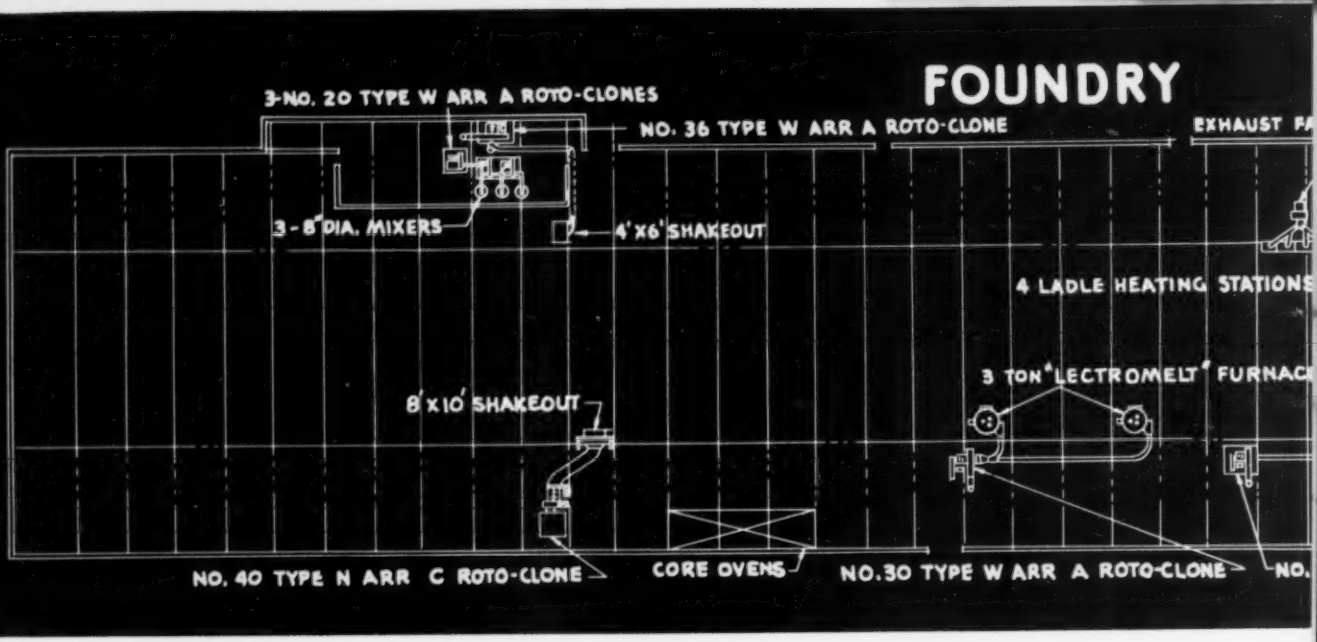
In Canada: Cleco Pneumatic Tool Company of Canada, Ltd., 927 Millwood Road, Toronto (Leaside), Ontario
DISTRIBUTORS IN PRINCIPAL CITIES OF THE UNITED STATES AND THROUGHOUT THE WORLD

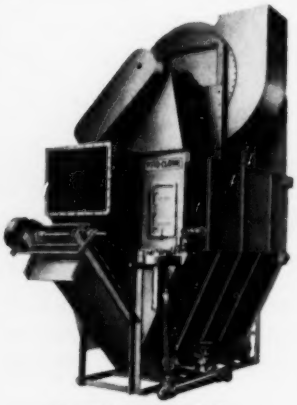
3950



16 ROTO-CLONES at COLLECT 17,400 LBS. OF DUST

Complete ROTO-CLONE Line Used For "A to Z" Dust-Control Service At Maynard Electric Steel Castings, Milwaukee, Wisconsin

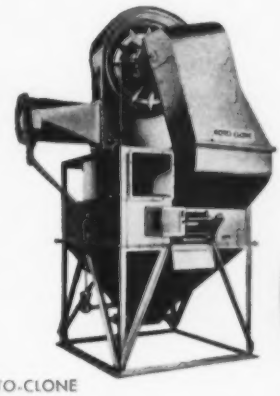
Operation	ROTO-CLONE	CFM
New Sand System	1—24 Type W Arr. A with Skimmer Precleaner	14,590
Wheelabrators—48"x 48" & 42"x48"	1—6 Type N Arr. C	6,305
Wheelabrator—48"x 72" & 2 Tumbling Mills	1—8 Type N Arr. C	7,830
3—Blast Rooms	3—Type N Arr. C	33,780
6—Swing Frame Grinders	2—24 Type D	27,850
2—Snag Grinders & Cutoff Saw	1—16 Type D with Skimmer Pre-cleaner	4,900
Total	9 ROTO-CLONES	95,255



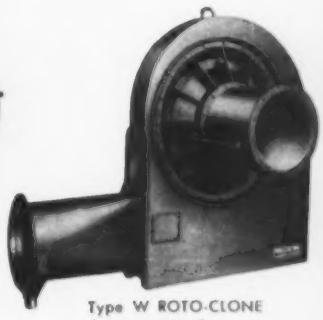
Type N ROTO-CLONE
Arrangement C

Type D ROTO-CLONE
With Skimmer Precleaner

Operation	ROTO-CLONE	Total CFM
Electric Furnaces	1—27 Type W Arr. A	6,110
	1—30 Type W Arr. A	16,900
Shakeout, 4'x6'	1—36 Type W Arr. C	25,050
Shakeout, 8'x10'	1—40 Type N Arr. C	41,000
Sand Mixers	3—20 Type W Arr. A	21,900
Total	7 ROTO-CLONES	110,950



Type W ROTO-CLONE
Arrangement C



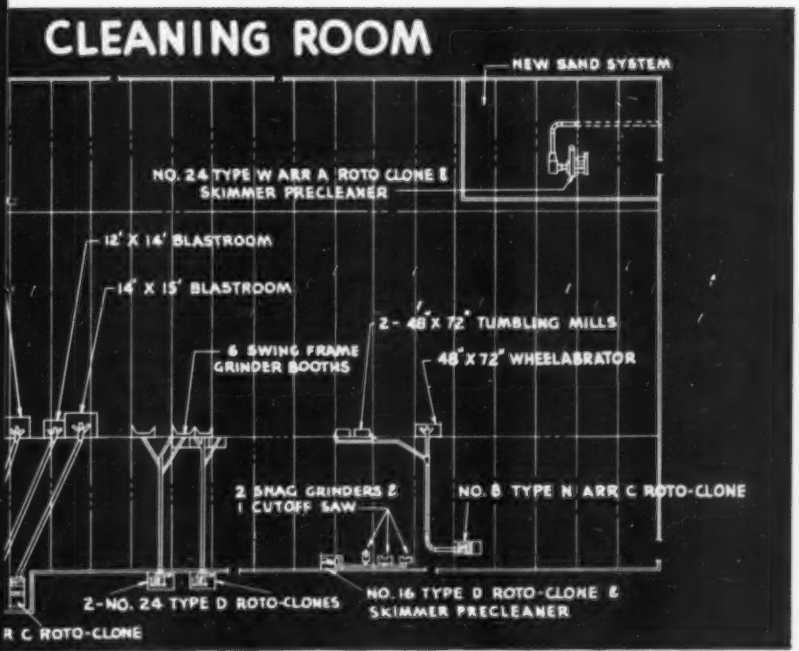
Type W ROTO-CLONE
Arrangement A

YPE W ARR A ROTO CLONE

Maynard
PER DAY

Here's a case history that brings you the ROTO-CLONE* story in a "nutshell". Sixteen units, representing the complete ROTO-CLONE line, were installed at Maynard over the five-year period 1944 through 1948. From time of installation to date, all units have operated on a 3-shift basis—that's 4 to 8 years of continuous, heavy-duty service. Parts replacement resulting from this 24-hour grind? Practically nil! **13 of the 16 ROTO-CLONES have had no parts replacement except for sludge ejector sprockets and chains.**

If you have dust problems, your local AAF representative is ready with the right answers. Call him or write us direct.

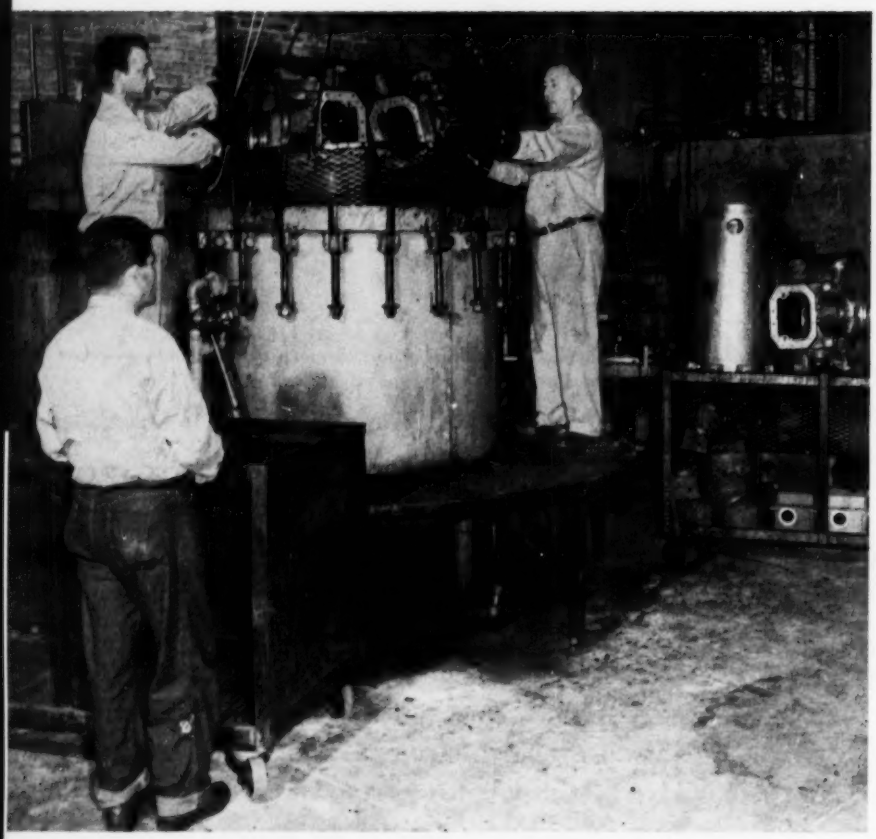

CLEANING ROOM
NEW SAND SYSTEM
NO. 24 TYPE W ARR A ROTO CLONE & SKIMMER PRECLEANER
12' X 14' BLASTROOM
14' X 15' BLASTROOM
2 - 48" X 72" TUMBLING MILLS
6 SWING FRAME GRINDER BOOTHS
48" X 72" WHEELABRATOR
2 SNAG GRINDERS & 1 CUTOFF SAW
NO. 8 TYPE N ARR C ROTO-CLONE
2-NO. 24 TYPE D ROTO-CLONES
NO. 16 TYPE D ROTO-CLONE & SKIMMER PRECLEANER
R C ROTO-CLONE

You Can Expect the Best From

American Air Filter
COMPANY, INC.

104 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

**ROTO-CLONE is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.*

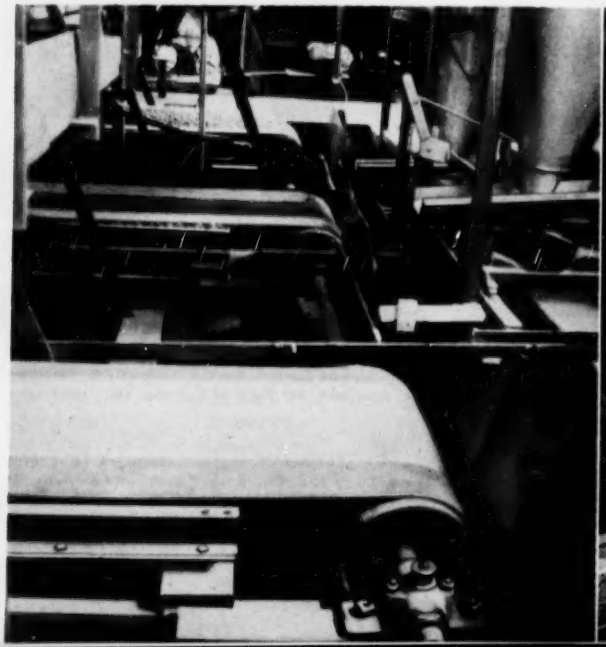


38. Casting Sealant

This photo shows machined castings being removed after impregnation with Polyplastex MC, a special sealant developed by this organization for ferrous and non-ferrous metals. This chemical makes porous castings tight, impervious to corrosive attack of non-inflammable hydraulic fluids, and provides a good base for a variety of coatings. *Polyplastex.*

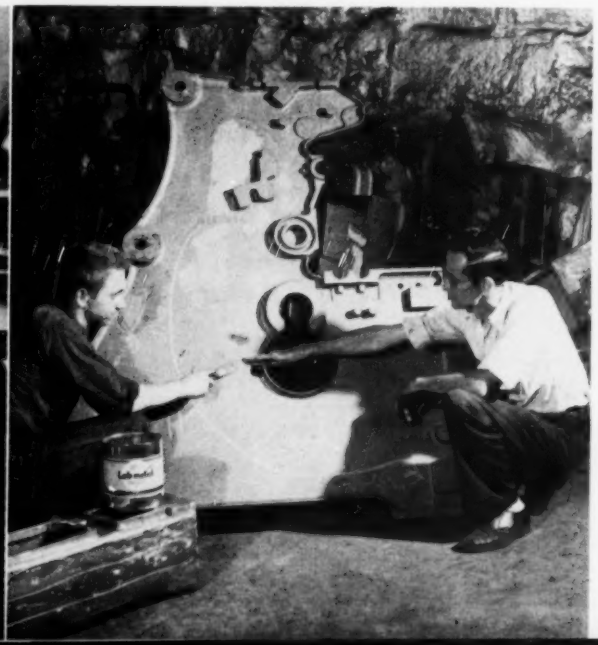
39. Cupola Gun Mix

CARGAN, a combination of materials scientifically blended to produce a ceramic bond of maximum density in air-placement or hand-patching processes of cupola and ladle lining, is available to foundrymen. It shows less droppage, less burn back, fast glaze at low cost. *Cargan Products Co.*



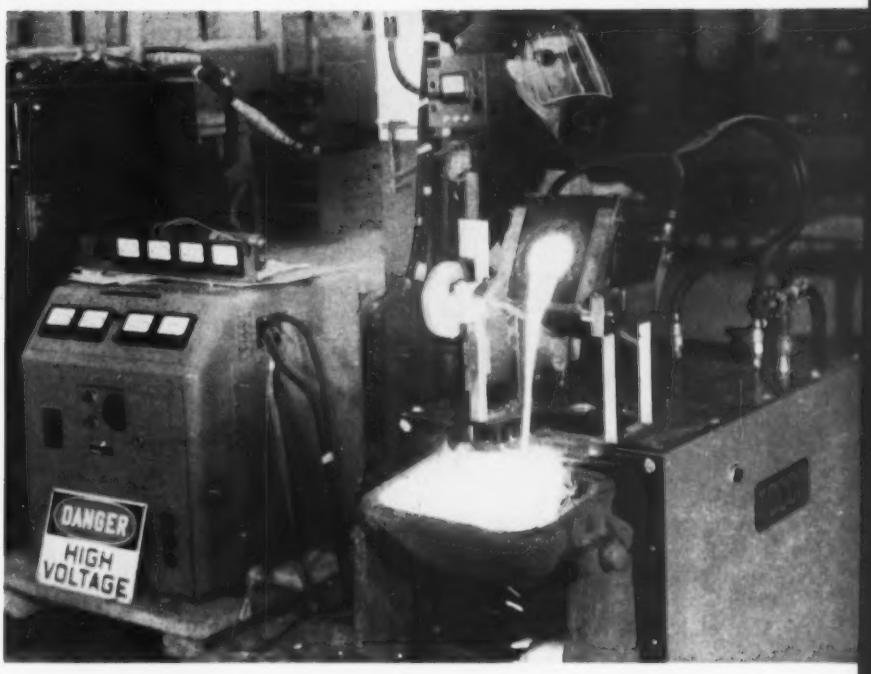
40. Permanent, Economical Filler

Product shown in photo, Lab-metal, is a reliable filler that can be used in almost any foundry for blow holes, sand holes and metal surfaces. Unusual ease of application and fast drying make it an excellent material for pattern labor. *Alvin Products, Inc.*



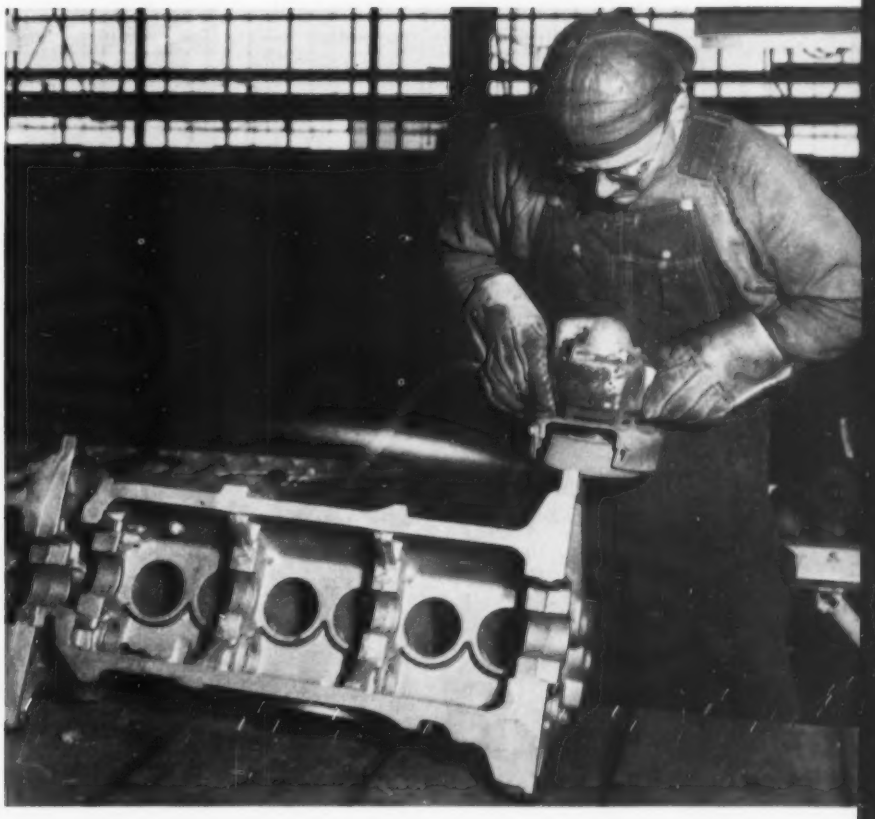
35. Induction Melting

This method of induction melting has numerous advantages, as outlined by Tocco. These major points include stepless power control, very rapid melting, high efficiency, good mixing, extremely low alloy loss, high reproducibility of results, no carbon pick-up, no contamination when composition of charges is changed. The company recently opened its new modern plant at Cleveland, Ohio, another forward step for a progressive concern. *Tocco Division, Ohio Crankshaft Co.*



36. Midget X-ray Unit

This new midget-type industrial 250,000-volt x-ray machine weighs less than 1/4th that of conventional units, is less than half the size. Although it is capable of x-raying steel up to 3½ inches in thickness, is easily portable in foundries and welding shops. *General Electric.*



37. Heavy Duty Vertical Grinder

The illustrated Master Power Model M-601 Heavy Duty Type Vertical Grinder, shown in use on motor casting, is one of the company's complete line of portable pneumatic tools for the foundry. Light weight is combined with extremely high power at several speeds, as desired by the user. *Master Pneumatic Tool Co.*

FOUNDREZ 7500

Your "Buy-Word" for Lower Cost

SHELL MOLDS

● Reichhold research continues to lead the way. This time RCI's pacesetter is FOUNDREZ 7500, the remarkable new powdered phenolic resin developed specifically for the shell molding process. Tests indicate that — due to the greater tensile strength attained with FOUNDREZ 7500 — this RCI product actually "goes farther" than similar resins, pound for pound, in the production of shell molds. Learn more about it . . . write for full information and free working samples — today!

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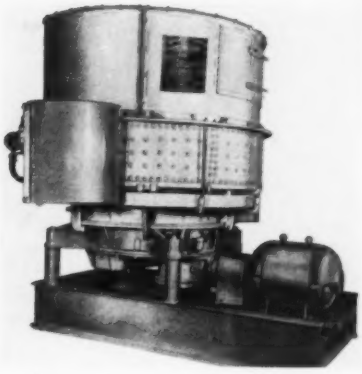
Phenol Glycerine • Phthalic Anhydride • Maleic Anhydride • Sodium Sulfate • Sodium Sulfite

Products Parade

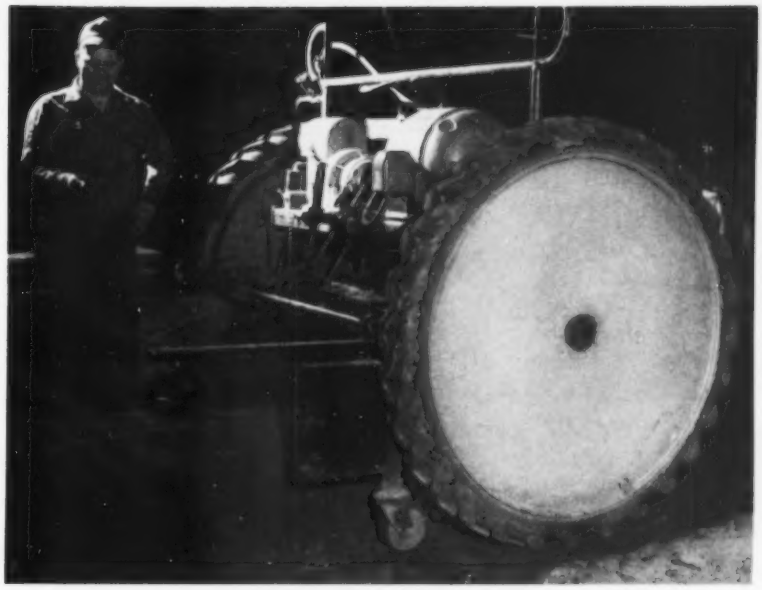


41. New Sand Muller

This model 80-A improved Speedmuller is claimed to have highest hourly capacity of sand mulled to maximum physical properties of any muller. Integral involute pump, directed force-feed lubrication, other features. *Beardsley & Piper.*

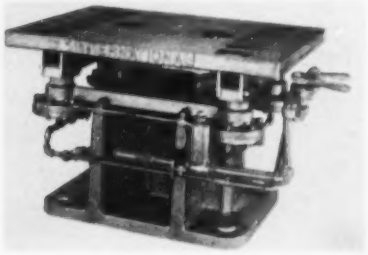
42. Compact Thermocouple Head

This new Serv-Rite thermocouple head eliminates weight and size but has all features of larger heads, plus many installation and service conveniences. Available with ½, ¾, or 1 inch SPT opening for protecting tube. *C. S. Gordon Co.*



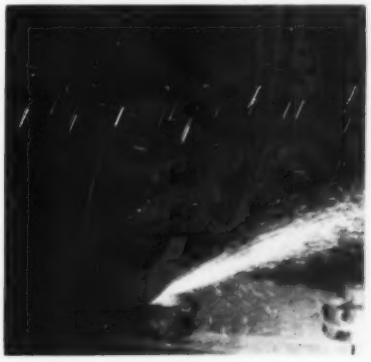
43. Variable Speed Sand Conditioner

This latest in the Moulders' Friend line features variable speed transmission, permitting any travel speed from 5 to 50 fpm forward or reverse. Conditions, screens and wet downs two tons of sand per minute. *Moulders' Friend.*



44. Rollover-Molder

This GJR Air Rollover, Air Draw Molding Machine is specially designed for-hard-to-draw jobs, offers exceptional accuracy of draw. It also features air-actuated clamps, air-operated equalizers, air vibrators, and convenient dual control values. *International Molding Machine Co.*



45. Biggest Magnetic Pulley

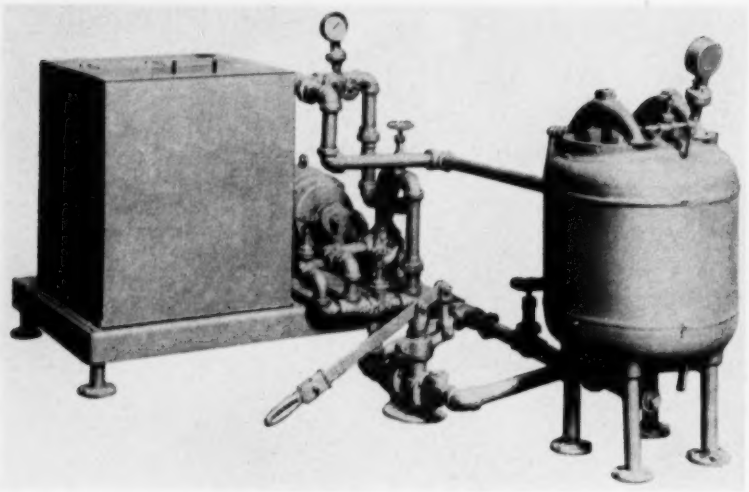
Here is what is claimed to be the biggest non-electric Alnico magnetic pulley ever built: 36 inch diameter, 36 inch belt width. It is used in a lead works to remove tramp iron, with capacity of 840 tons per hour. It is typical of the products manufactured by *Dings Magnetic Separator Co.*

46. Grinding Wheels

The Precision grinding wheel shown in action is typical of the company's full line of quality grinding wheels for the foundry industry. Units are tailor-made for individual application, include floor stand, swing frame, and portable models. *Precision Grinding Wheel Co.*

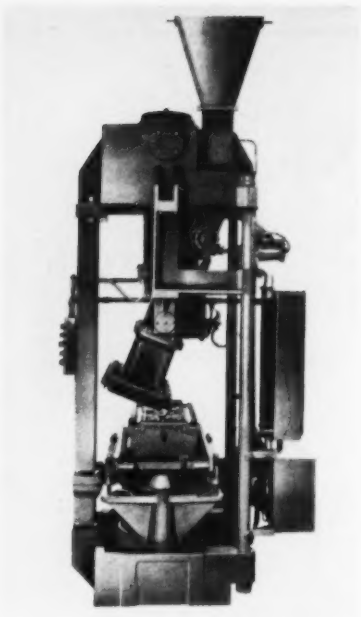
Products Parade

For further information, check postcard, page 33.



47. Casting Reclaiming Process

Castings rejected because of microporosity may be reclaimed inexpensively with this newly improved ImpreSeal Process equipment. This impregnation process uses a metal base sealant consisting of an ultra-finely divided suspension of metallic oxides and other minerals carried in an aqueous solution. Heat and pressure forces tiny particles into microscopic voids and channels of porous areas. Product is simple, economical, versatile in use. Only 20 minutes required for complete impregnation cycle for many types of parts. Systems available for batch impregnation or internal impregnation in sizes to fit every job. Full information, free trial offer. *Tincher Products Co.*

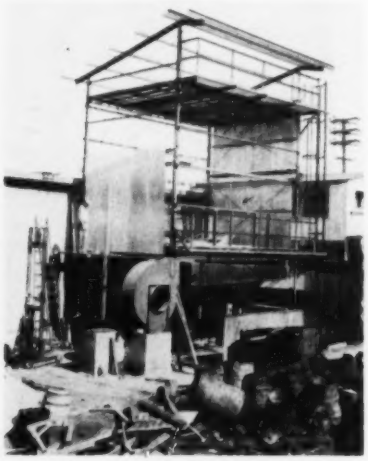


49. Core Blower

Sutter Model SP-220 Core Blower, pictured above, incorporates many important features for lower maintenance, greater ease of operation, increased output. "Tilt-fill" sand chamber, rigid support, full access to core box. *Sutter Products Co.*

48. Air Control Valves

Manufacturer says this automatic air control valve will improve the efficiency of air suction systems and dust collectors. The Ventomatic Valve shown operates automatically, eliminates hand operation, and is adaptable to old or new equipment. Presenting an absolutely unobstructed passage for air stream when open, the valve entirely eliminates clogging. The unit is available for AC current only, to fit 3, 4, 5, 6, 7, and 8 inch diameter pipes, and all intermediate sizes. Information supplied on any special dust-collecting problems. *Kindt-Collins Co.*



50. Dust and Fume Control

Easily erected bag house using standard structural steel members contributes to low cost of the dust and fume control system. Bag house may contain silicone treated glass fabric bags or special non-shrinking Orlon bags for varying temperatures. *Harsell Engineering Co.*

CONTROL
is our role!

On the seas, in a foundry or a steel plant . . . *control* is essential. It's the chief role of Keokuk Electro-Silvery in charging the cupola or blocking the open hearth. For with Keokuk, you are *assured* of *accurate* percentages of silicon . . . and, as suits your melt, alloys of manganese, chrome or nickel in various combinations. So, control both quality and costs with Keokuk. Write today for complete information!

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In sailing, much depends upon control. Here, Chief Keokuk handles the tiller; Junior, the boom; and Princess Wenatchee makes ballasting an eye-popping pleasure!

Keokuk Electro-Silvery . . . available in 60 and 30 pound pigs and 12½ pound piglets . . . in regular or alloy analysis. Keokuk also manufactures high silicon metal.

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AJAX

LO-VEYORS

Cutting Costs
in
CUSTOM *and* **PRODUCTION**
Foundries

● When the pressure is on for lower cost of castings-per-pound, it is a smart idea to cut sand handling costs.

Ajax Lo-Veyors take sand handling out of the non-productive labor column. And that is something to think about right now when you think of cost per man per hour.

Ajax Lo-Veyors are made in open and closed pan types for installation on or below the floor. They are complete, self-contained units. No exposed head and tail pulleys or bearings,—low first cost, low installation cost and low maintenance cost. Used by America's foremost custom and production foundries for conveying, scalping and separation of sand, sprues, core wires and other foundry materials.

Write for money-saving facts.

AJAX FLEXIBLE COUPLING CO. INC., WESTFIELD, N. Y.

This recent Schneible Multi-Wash installation is typical of many such systems that are today helping management get that extra worker incentive necessary to produce more and better castings. A noticeable lift to output and employee relations has been the result of providing clean, healthful surroundings through efficient control of foundry fumes and dirt.

These 10 Multi-Wash units, having a total of 130 washing stages, remove the dirt from 350,000 cfm of air every minute. Water, at the rate of 1500 gallons per minute, is recirculated through the system to remove and convey the collected material to a central disposal tank, which also serves 40 other Multi-Wash units.

Schneible patents cover all features that make Multi-Wash the only dust collector using the wet method principle, that provides multiple washing action and an efficiency rating of 99.9%, by actual scientific tests.

PRODUCTS:
Water Curtain Cupola Collectors • Multi-Wash Collectors • Uni-Flo Standard Hoods • Uni-Flo Compensating Hoods • Uni-Flo Fractionating Hoods • Ductwork • Velocitrap • Dust Separators • "Wear Proof" Centrifugal Slurry Pumps • Settling and Dewatering Tanks • Entrainment Separators

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

CLAUDE B. SCHNEIBLE COMPANY
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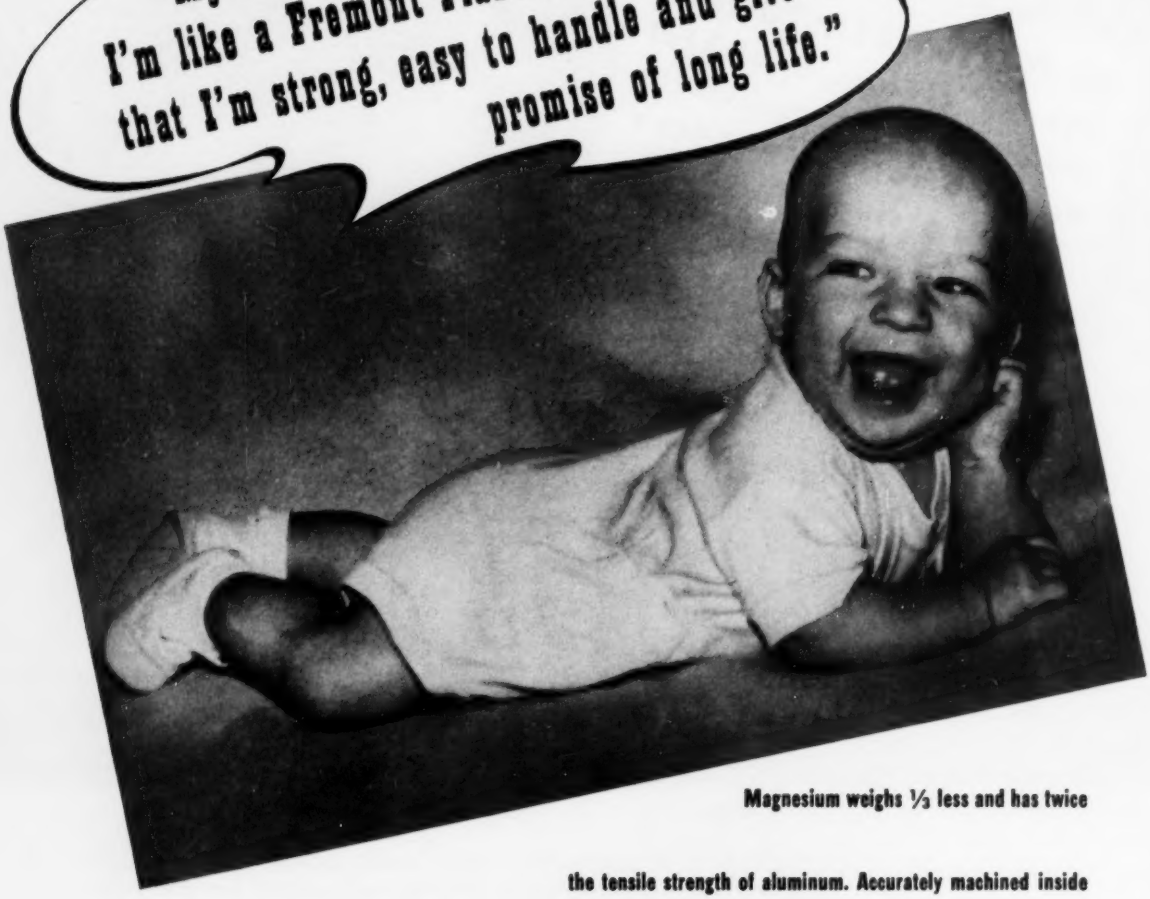
ENGINEERING REPRESENTATIVES IN PRINCIPAL CITIES

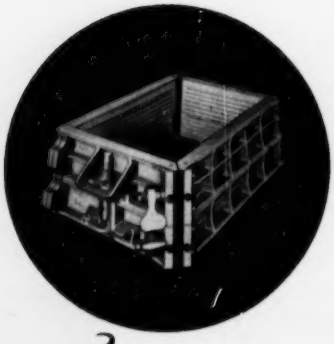
SCHNEIBLE

"My dad says
I'm like a Fremont Flask . . . .
that I'm strong, easy to handle and give
promise of long life."

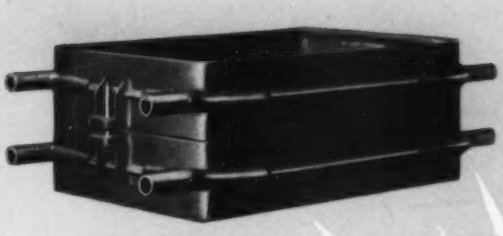


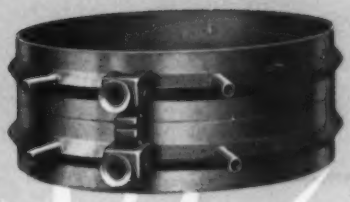
Magnesium weighs ⅓ less and has twice the tensile strength of aluminum. Accurately machined inside surfaces and flanges, and steel-faced top and bottom flanges, make more exacting work possible with Fremont Flasks. Write today for free literature and prices on the new

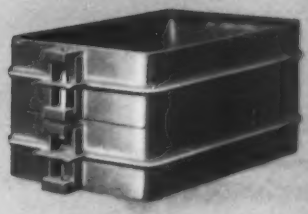
FREMONT SPREADLOCK FLASK, FREMONT STANDARD SLIP FLASKS, FREMONT CAST IRON OR CAST ALUMINUM JACKETS



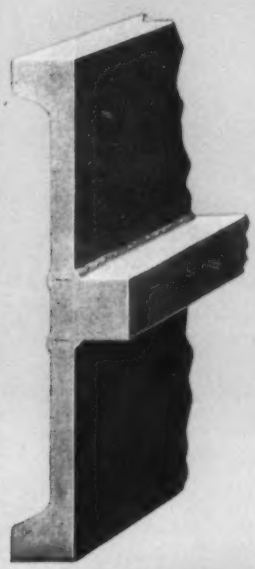
THE FREMONT FLASK COMPANY
Fremont, Ohio







Sterling



MEANS EVEN MORE IN CONNECTION WITH FOUNDRY EQUIPMENT THAN WITH SILVER

For almost a half century, the name "Sterling" has been associated with the very highest quality in foundry flasks. Here's why: Every Sterling Flask is carefully fabricated from special hot rolled channel steel having a tensile strength of 70,000 lbs. The steel also has controlled carbon content and copper bearing . . . features that add years to the life of the flask. This construction gives you the practical combination of maximum strength with minimum weight. It assures accuracy and speed in molding. Each rolled steel section, equipped with welded fittings, forms a solid, rigid piece. A heavy reinforcing rib is rolled in the center of each section to resist torsional and other strains. The heavy rolled steel sand flanges have square corners and full width bearing. Partings are accurately machined, not just surface ground. And there's plenty of metal left for re-machining if necessary. Frankly, can you think of any other foundry flask that gives you so many life-prolonging features?

You Will Find Sterling Steel Flasks in More Than 13,000 Foundries, All Over the World

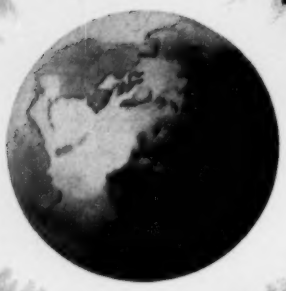
STERLING WHEELBARROW COMPANY

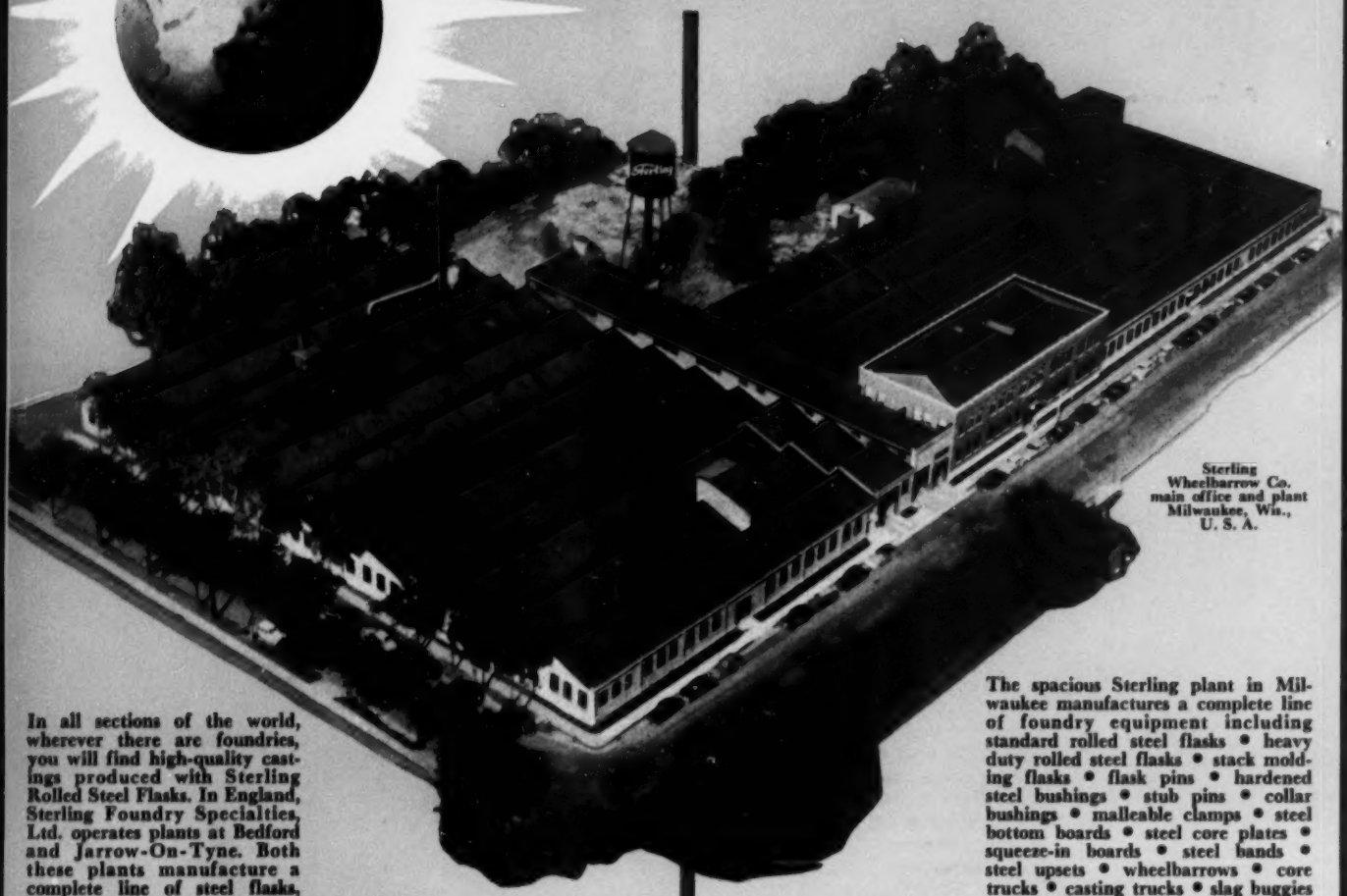
Main Office and Plant, Milwaukee 14, Wisconsin, U. S. A.

***Subsidiary Company* STERLING FOUNDRY SPECIALTIES LTD., ENGLAND**

Sales Offices at London and Bedford — Factories at Bedford and Jarrow-On-Tyne

The Sun Never Sets on Sterling



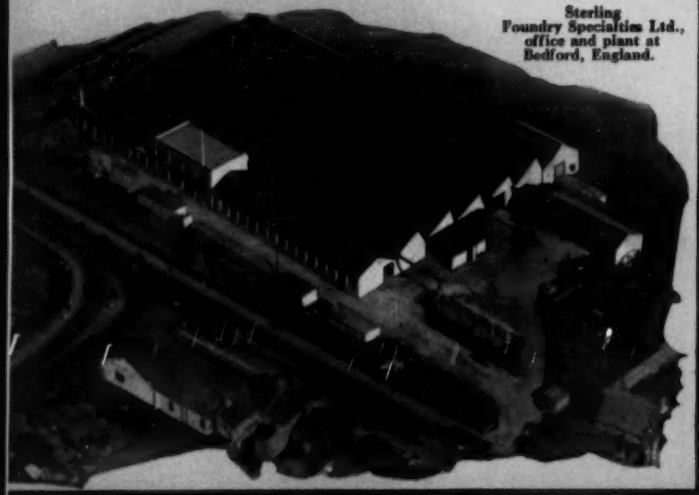


Sterling Wheelbarrow Co. main office and plant Milwaukee, Wis., U. S. A.

In all sections of the world, wherever there are foundries, you will find high-quality castings produced with Sterling Rolled Steel Flasks. In England, Sterling Foundry Specialties, Ltd. operates plants at Bedford and Jarrow-On-Tyne. Both these plants manufacture a complete line of steel flasks, pins, bushings, bottom boards and core plates.

The spacious Sterling plant in Milwaukee manufactures a complete line of foundry equipment including standard rolled steel flasks • heavy duty rolled steel flasks • stack molding flasks • flask pins • hardened steel bushings • stub pins • collar bushings • malleable clamps • steel bottom boards • steel core plates • squeeze-in boards • steel bands • steel upsets • wheelbarrows • core trucks • casting trucks • slag buggies • casting carts • steel wheels • casters. Write for new Foundry Equipment Catalog No. 64A.

Sterling Foundry Specialties Ltd., office and plant at Bedford, England.



Sterling Foundry Specialties Ltd., office and plant at Jarrow-On-Tyne, England.

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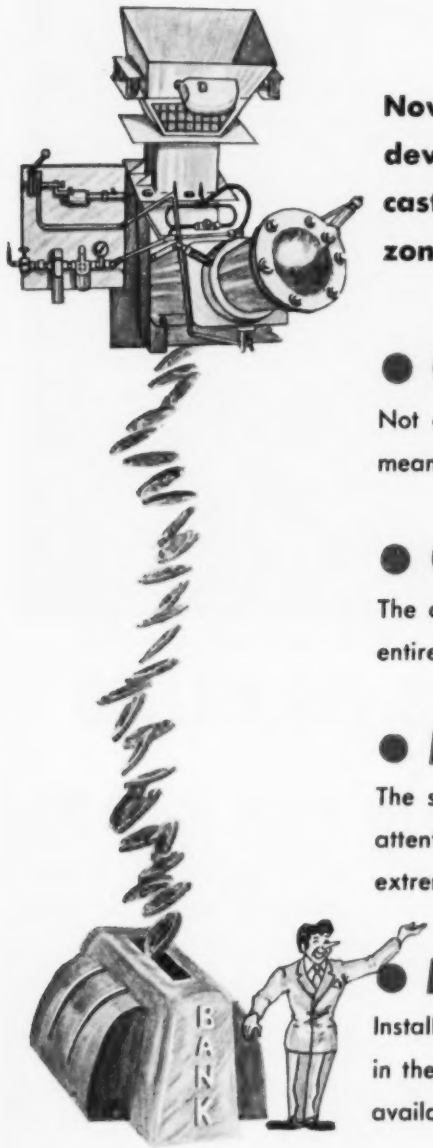
STERLING WHEELBARROW COMPANY

Main Office and Plant, Milwaukee 14, Wisconsin, U. S. A.

Subsidiary Company STERLING FOUNDRY SPECIALTIES LTD., ENGLAND

Sterling Foundry Specialties Ltd. operates plants at Bedford and Jarrow-On-Tyne

NEW PROCESS *Solves* DISPOSAL of SHOP BORINGS and TURNINGS!



Now for the first time through a revolutionary new development Croft has found the answer to charging cast iron chips *directly* into the cupola at the melting zone.

● CROFT'S CAST IRON CHIP FEEDER

Not only solves the disposal of your waste borings and turnings but means greater savings to your foundry.

● CUTS FOUNDRY COSTS

The chip feeder unit saves up to $20.00 per ton of metal melted. It entirely eliminates briquetting or canistering of borings.

● ECONOMICAL AND SIMPLE OPERATION

The simple and rugged unit operates on 80 lbs. air pressure without attention. The Croft chip feeder involves low initial expenditure and is extremely simple to install.

● DON'T DELAY * * * * * INQUIRE TODAY

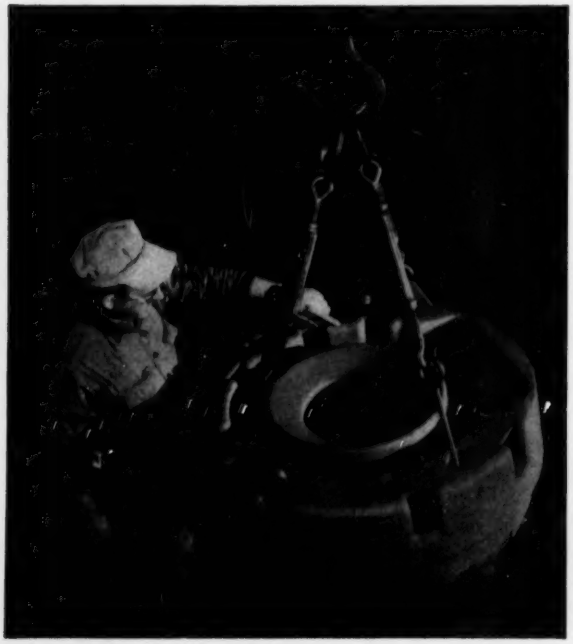
Installing a Croft chip feeder unit in your foundry is like putting money in the bank. Begin to reap your rewards at once. Complete units are available for immediate installation to suit your needs.

Inquire Representative United States and Canada:

MEEHANITE METAL CORPORATION

714 North Avenue New Rochelle New York

BETTER CORES, BETTER CASTINGS, FOR BULLARD



with Truline® Binder in the Mix

Section of an iron casting for a Bullard Vertical Turret Lathe, pictured above, shows the clean smooth results that Truline helps to produce.

The Bullard Company, Bridgeport, Conn., reports a considerable saving in binder costs since their switch to Truline. Because Truline-bonded cores shake out quickly and easily, cleaning and chipping are reduced appreciably.

Learn how you can get *more* out of your ovens—and save labor and materials at the same time. Our foundry service men will be glad to give you details about overnight baking with Truline.

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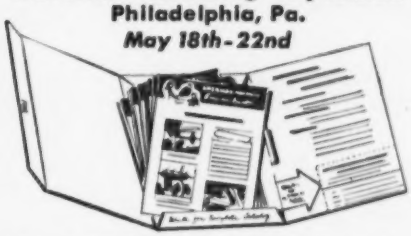

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"BETTER CASTINGS, CHEAPER, under BETTER CONDITIONS" . . . with HYDRO-BLAST

The function of Hydro-Blast is to be fundamentally useful to the Indispensable Industry — to enable foundries to make better castings, cheaper, under better working conditions.

BETTER CASTINGS

Hydro-Blast sand reclamation enables the foundryman to work with sand of a pre-determined uniform quality. Hydro-Blast reclamation provides a positive control over grain size and physical characteristics. The result is better castings, easier to clean and machine, with fewer rejects.

The benefits of cleaning castings by the Hydro-Blast wet sand method are well known. Core knock-out and surface cleaning are accomplished in a fraction of the time required by obsolete methods. This system leaves the metal completely clean, removes even the invisible, imbedded sand particles that might later set up destructive abrasion.

CHEAPER

By using Hydro-Blast reclaimed sand, many foundries have eliminated 85 to 95% of new sand cost and transportation charges. Savings effected by many of these systems are repaying their entire cost in less than two years, in some cases less than a year.

Hydro-Blast cleaning units produce cleaner castings with remarkable savings in man-hours. Here too, Hydro-Blast equipment pays for itself in a remarkably short time.

BETTER CONDITIONS

Dust removal is an important corollary benefit of Hydro-Blast cleaning. The wet sand stream literally pulls the dust out of adjacent foundry air. A test made with a foundry in full operation showed this: dust concentration within 50 feet of a Hydro-Blast unit drops 50% within half-an-hour after Hydro-Blasting begins.

Hydro-Blast air cleaning systems operate on this same (Venturi) principle, successfully dispose of dust over shake-outs or at other sources of excessive dust.

CUSTOM JOBS, with NO UNDUE DELAY

All Hydro-Blast equipment is custom-engineered to the user's specific requirements. Every client gets the full benefit of Hydro-Blast's extensive experience in solving problems for the foundry industry. And customers can count on delivery with no undue delay.

It's good business to discuss your foundry problems with Hydro-Blast engineers.

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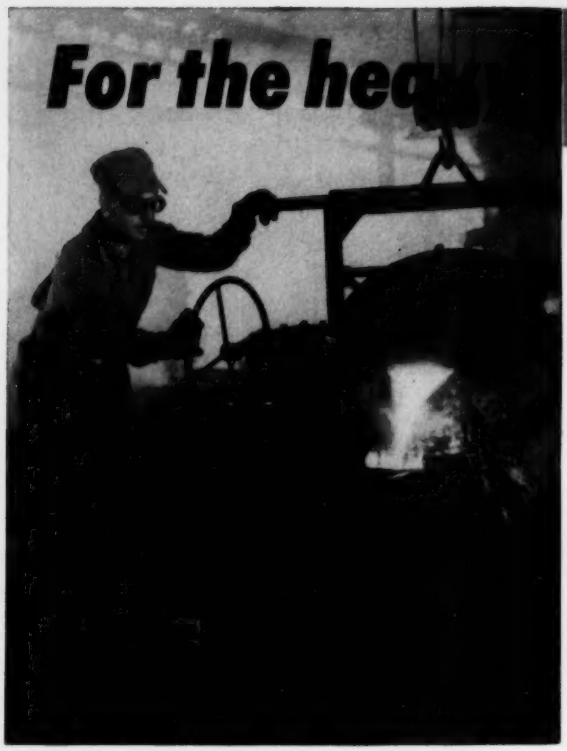


For the hea... tough jobs...

200 Foundries Have Converted to BS&B HEAVY DUTY Foundry Flasks

Like any BS&B Foundry Flask, the Heavy Duty is tailor made . . . designed for your particular needs . . . designed to do the best job for you. This is what 200 major foundries have found who have converted to them in the last 15 years.

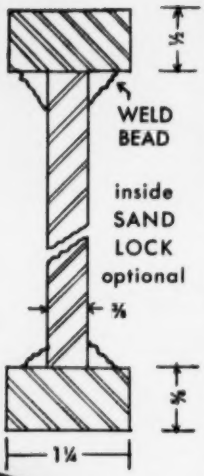
Only BS&B gives you all three of these features in a heavy duty flask—bearing strips welded both inside and out, cast steel trunnions, and cast steel pinlugs and clamplugs. In addition, it's the only flask offering a minimum of weight for easy handling, considering the material used to give it the greatest rigidity. These 200 foundries who have converted to the BS&B Heavy Duty Flask have recognized the economy of having the best equipment for the job . . . of enjoying minimum maintenance and replacement as the years pass.

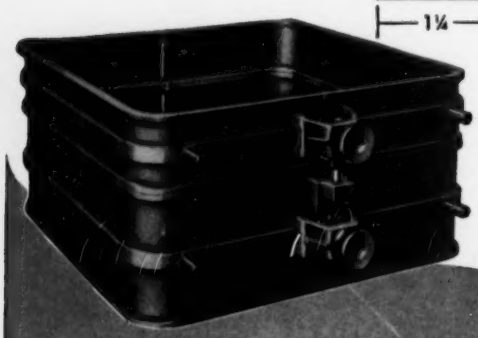
BS&B Foundry Flasks are designed by foundrymen . . . fabricated by skilled workmen using quality materials. They're constructed entirely of steel . . . sections surface ground, or machined both top and bottom, for tight joint at parting line. You, too, will profit from the many advantages of this heavy duty flask. Write for your FREE copy of the BS&B Foundry Flask Handbook.

Foundry Flask Division
Dept. 7-AQ4

Cross Section of Style FP 22
showing wall thickness, bearing bar size and welding. The reinforcing rib is optional, and is designated as Style FP 22R.

BS&B Heavy Duty Flask Style FP 22R
has solid bar reinforcing rib wherever required, particularly on large or deep sections. Like all BS&B Foundry Flasks, this style is available in round, square, rectangular and special shapes. Thickness of wall, size of bearing bars and reinforcing ribs are optional depending on individual foundry requirements.





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The shell molding process offers notable economies in both long- and short-run production of ferrous and non-ferrous castings.

LONG RUN PRODUCTION. Shell molds yield castings almost pattern-smooth, with tolerances as close as .003 to .005 inches per inch. This feature greatly reduces finishing costs. Moreover, there is a high percentage of sound, uniform castings, with fewer rejects.

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ENGINEERING GUIDANCE. Correct use of the bonding resin is important to successful shell molding, for which you may wish to have expert guidance. A good starting point is to consult with Bakelite Company engineers located in principal cities.

To get the basic story on the shell molding process and the BAKELITE Phenolic Resins developed for it, mail the coupon today!

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- Accuracy of draw
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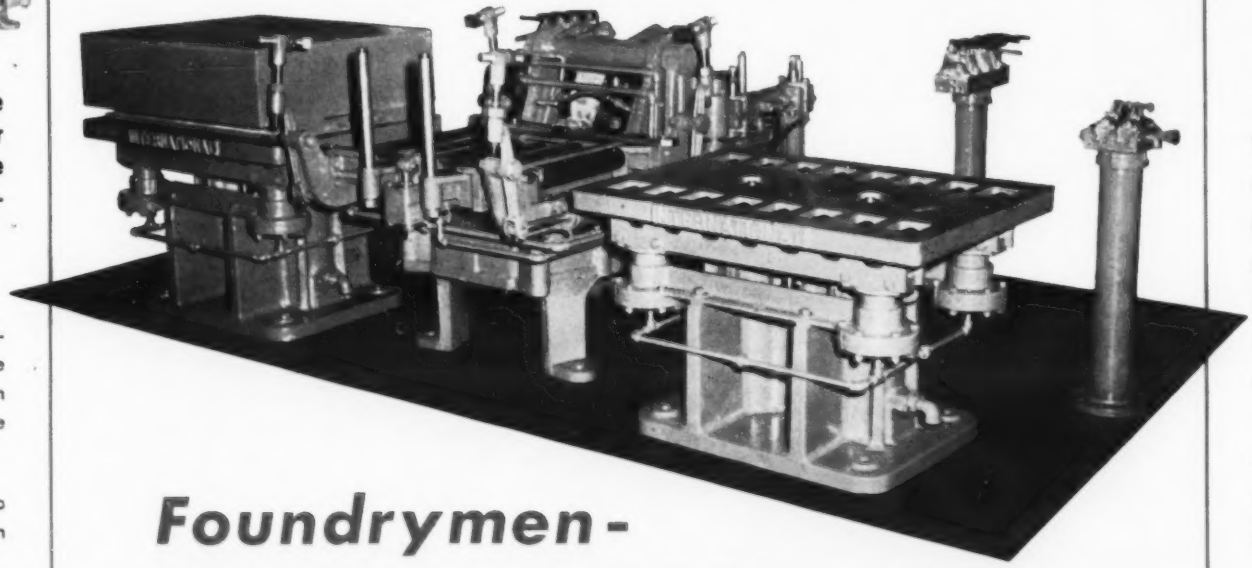
Combining International Types GJR and JJR Machines



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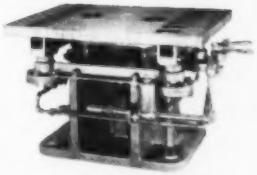
TYPE JJR



The International Type JJR Machines incorporate the DOUBLE JOLT FEATURE and the sturdiness so necessary to give a positive ram throughout the core or mold.

On the JJR Machine, the rollers are an integral part of the machine and are actuated by air cylinders for the ease of loading and unloading, resulting in faster, cheaper operations.

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FOUNDRYMEN EVERYWHERE WILL WANT AN AUTHENTIC RECORD OF EVENTS RELATED TO THE AFS 1953 NATIONAL CONVENTION ... AND THE MAY ISSUE OF AMERICAN FOUNDRYMAN WILL BE REPLETE WITH CONVENTION DETAILS.

Official Review of the ..... 1953 Foundry Congress

ABC

AMERICAN FOUNDRYMAN

is edited expressly for the purpose of rendering maximum service to the foundry industry. Small foundries as well as big plants regularly are considered when technical-practical material is selected and prepared for each issue.

By circulating the official record of the AFS Foundry Congress to every major foundry center, AMERICAN FOUNDRYMAN will make it possible for this Important Industry Meeting to be relived by the thousands of foundrymen who naturally will turn to AMERICAN FOUNDRYMAN for a comprehensive review of events that transpired during National Convention Week, May 4-8.

For those foundrymen who cannot attend this function in person, the May AMERICAN FOUNDRYMAN will be the link . . . to the latest techniques and developments . . . to new equipment . . . to major business and social events that will influence the future of a leading mass production industry.

That's why all divisions of the foundry field will watch the...

MAY AMERICAN FOUNDRYMAN

Official Publication of the

American Foundrymen's Society

616 South Michigan Avenue Chicago 5, Illinois

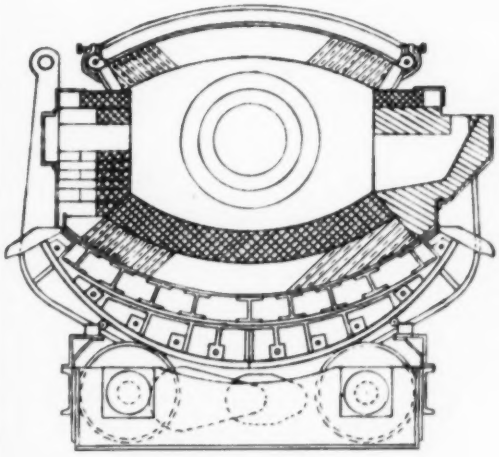
Here's how to HOLD THAT LINING in your holding furnace

Operators of Whiting* Cradle and similar types of holding furnaces use Taylor Sillimanite (TASIL) brick and cement to prolong the life of refractory linings. Recommended practice is to "*balance*" the super-duty fire brick lining with 9" of TASIL brick, laid in TASIL No. 301 Cement, for both side walls and bottom, in the areas subject to the damaging wash of molten iron and slag. (See refractory construction shown in engineering drawings below.)

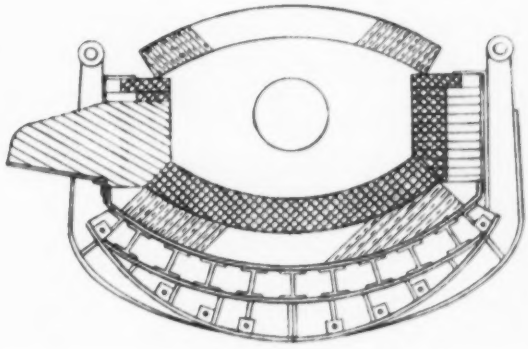
A TASIL "balanced" lining at one plant is averaging 6-8 weeks on side walls and 9-12 months on bottoms, with patching. TASIL was tried after a super-duty fire brick lining failed in three days because of joint attack and severe erosion at the metal line. This furnace is fired with pulverized coal and runs 700 tons per week of grey iron, tapped from cupola at 2750° to 2800° F.

Wherever you use fireclay-base, high alumina, kaolin or similar refractories, TASIL will give more effective service. Let a Taylor field engineer discuss with you the savings Taylor Sillimanite can make in your plant.

Tasil "Balanced" Lining In Whiting Cradle Furnace



Section through Pour-in Spout



Section through Pour-out Spout

TASIL sidewalls and bottom 9" thick. TASIL top course in sidewall 13½" thick.

= Taylor Sillimanite

* Built by Whiting Corporation, Harvey, Ill.

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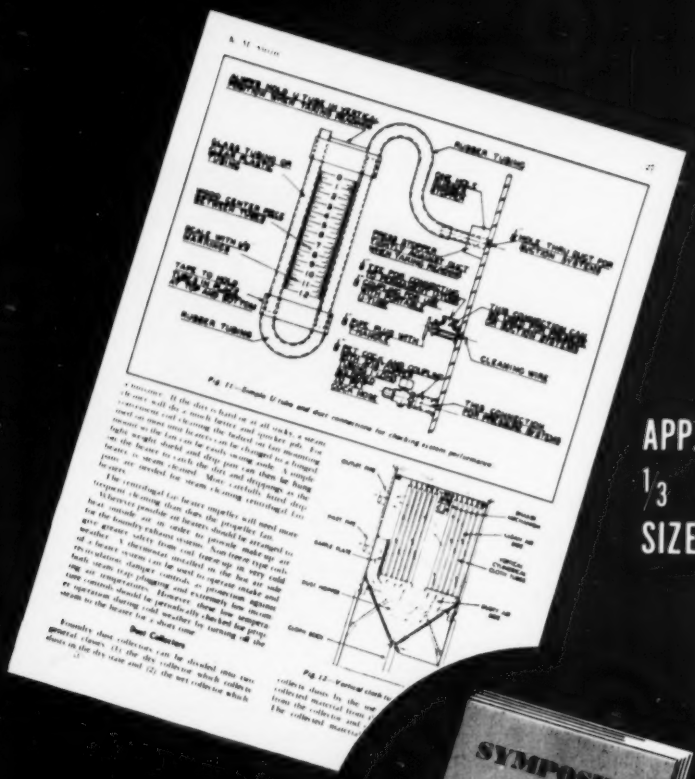

APP. 1/3 SIZE

ON GOOD WORKING CONDITIONS

. . . and the A.F.S. SYMPOSIUM ON AIR POLLUTION, comprised of papers presented at Safety, Hygiene and Air Pollution sessions during the International Foundry Congress, approaches the problems of air pollution in relation to foundry progress.

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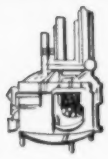
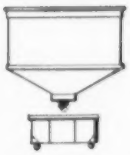
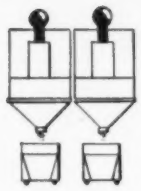
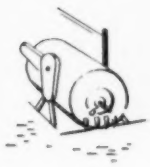
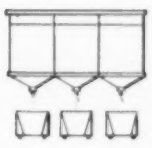
				
	✓1. Rigid scrap selection. ✓2. Preliminary carbon and manganese analysis. ✓3. Complete chemical analysis.	✓4. Accurate and continuous control of pouring temperature. ✓5. Accurate and continuous control of quench temperature.	✓6. Visual and metallographic inspection in as-cast condition. ✓7. Hardness check in as-cast condition. ✓8. Continuous inspection of screening operation.	✓9. Recording temperature control. ✓10. Removal of objectionable material.
SECOND SCREENING	**FIRST HEAT TREATING**	**SECOND HEAT TREATING**	**FINAL SCREENING**	**BAGGING**
				
✓11. Continuous inspection of screens.	✓12. Automatic control and permanent record by recording instrument of heat treat time and temperature.	✓13. Automatic control and permanent record by recording instrument of heat treat time and temperature. ✓14. Continuous tests for hardness and carbon content. ✓15. Continuous microscopic inspection.	✓16. Continuous inspection of screens and shot. ✓17. Daily laboratory checks of screening accuracy.	✓18. Continuous inspection of shot. ✓19. Daily shot breakdown tests.

How many perfect castings do you make in a hundred million pieces? One average shipment of shot, either iron or steel, contains that many individual castings. The greater percentage of imperfect castings it contains, the faster it breaks down and requires replacement. Even slight variations in structure or hardness can have a tremendous effect on cleaning costs.

After years of research, Wheelabrator has developed and patented a method for producing shot with an absolute minimum of defective pellets. It took a new plant and new production methods in order to achieve this quality and there are 19 CONTROL CHECKS to see that it is maintained.

This new "Wheelabrator" Steel Shot is made of the finest electric furnace steel which is heat treated to a tempered Martensite microstructure, the hardest and toughest of the iron carbon alloys. It is given a double heat treatment at automatically controlled temperatures to provide a new standard of toughness, solidity, uniformity and efficiency.

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Bulletin 89 tells the complete story about "Wheelabrator" Steel Shot and what it means to the user in terms of performance and economy. Write for your copy today.

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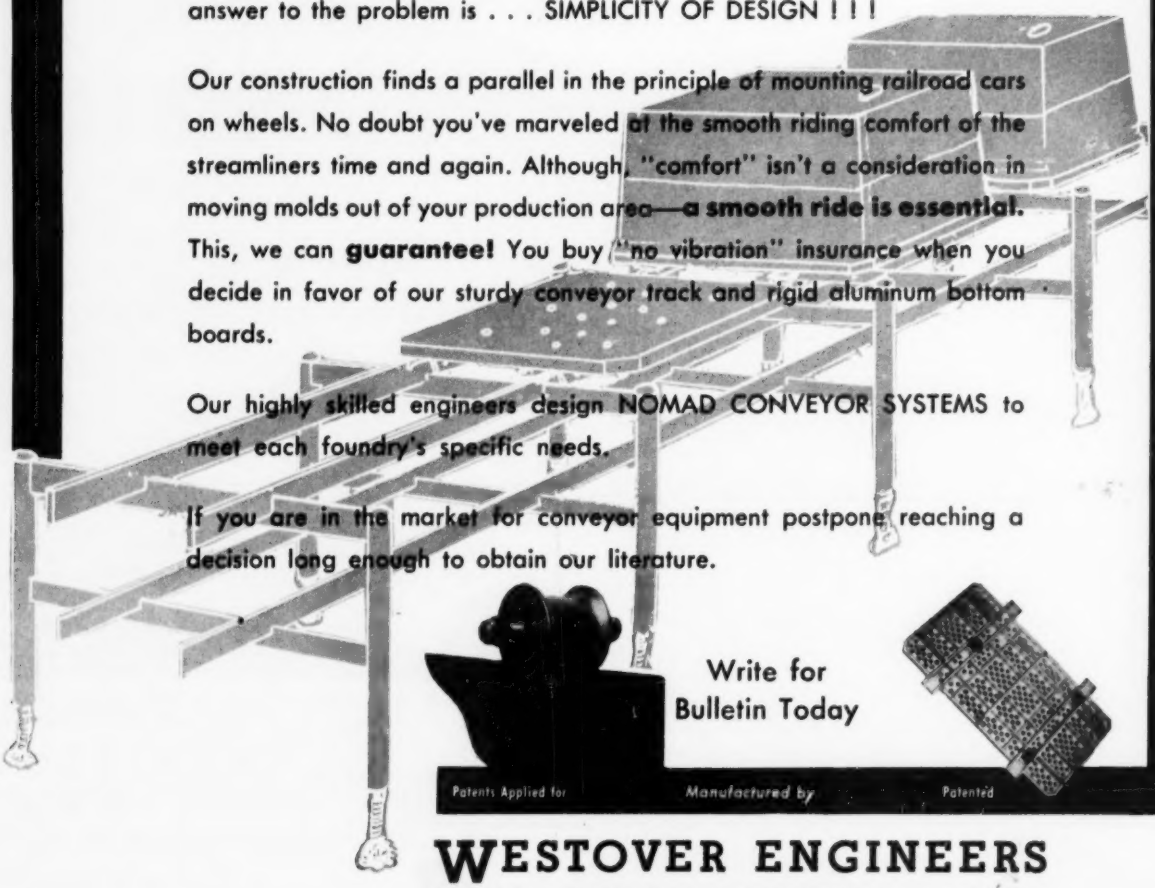

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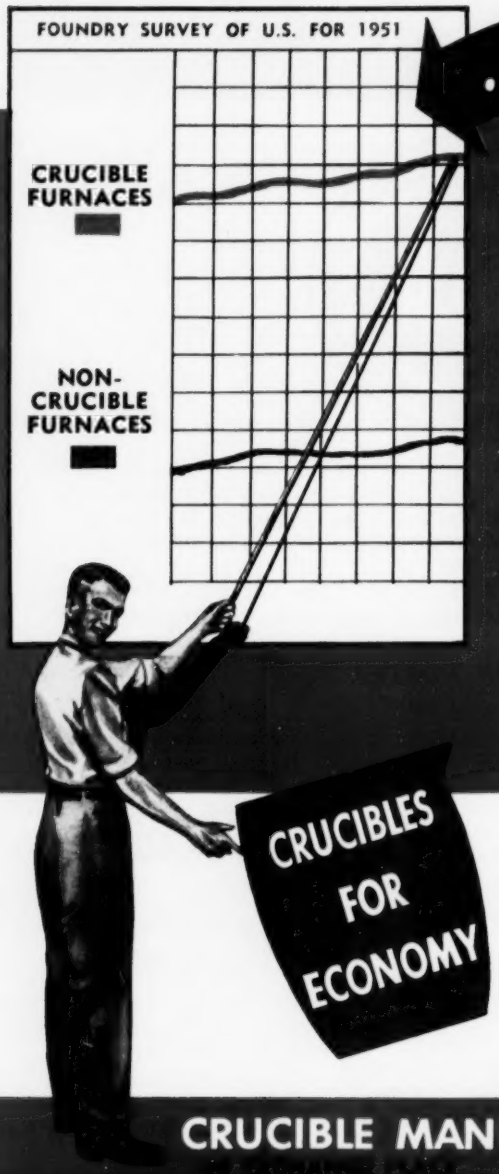

A foundry survey* of the United States for 1951 gives capacity of all Crucible furnaces at 4,703,037 lbs. of non-ferrous metals: all non-Crucible furnaces, capacity 1,406,165 lbs.

According to the same survey, the total capacity per charge of all Crucible furnaces is steadily increasing; thus, in 1950 the figure was 4,322,008 lbs., an increase for 1951 of 381,000 lbs. or 8.8%.

Foundrymen know their melting methods. Such persistent popularity and preference result from a combination of advantages obtainable only with Crucible melting.

*The Foundry Industry Data Book—The Foundry

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Editorial

Turning the Heads of Foundrymen . . .

■ Once again the eyes and minds of foundrymen turn toward the annual foundry convention . . . this time the 57th staged by A.F.S. as the technical society of the foundry industry, in Chicago, May 4-8. Literally, these events are arranged by and for the industry, since the technical programs and other sessions reflect the activities, desires and estimates of the interest of the industry as made by foundry committees.

These conventions are a direct reflection of the activities of the sponsoring Society and, "as the conventions go, so goes the Society." Thus we find the Safety & Hygiene & Air Pollution Program cooking up a substantial dish (three sessions), including introductory material for manuals on air pollution and dust and ventilation control. Growing interest in non-ferrous research is reflected in sessions and papers on brass and bronze and the light metals, including the so-called "miracle metal" titanium.

Someone recently stated that the major foundry developments in the next fifty years would be in melting practice, a statement perhaps reflected in the furnace operation and practice sessions on May 4 and 5. Fundamental studies on what happens to metal in a mold are reflected in two heat transfer sessions. Three divisions (Gray Iron, Sand, Steel) have banded together in a symposium on sand reclamation, another currently "hot" foundry subject.

Progress in each of the A.F.S. research projects will be brought out in various papers. Current interest in shell molding has produced a round-table luncheon on May 4, and several other papers and discussions. Nodular iron will be given a share of attention. The gray iron and sand shop courses illustrate the Society's constant attention to practical foundry problems and their solution. We find also (all developments of Society activities) sessions on plant and plant equipment, costs, refractories, time-study and methods, and patternmaking, the latter essentially practical in nature.

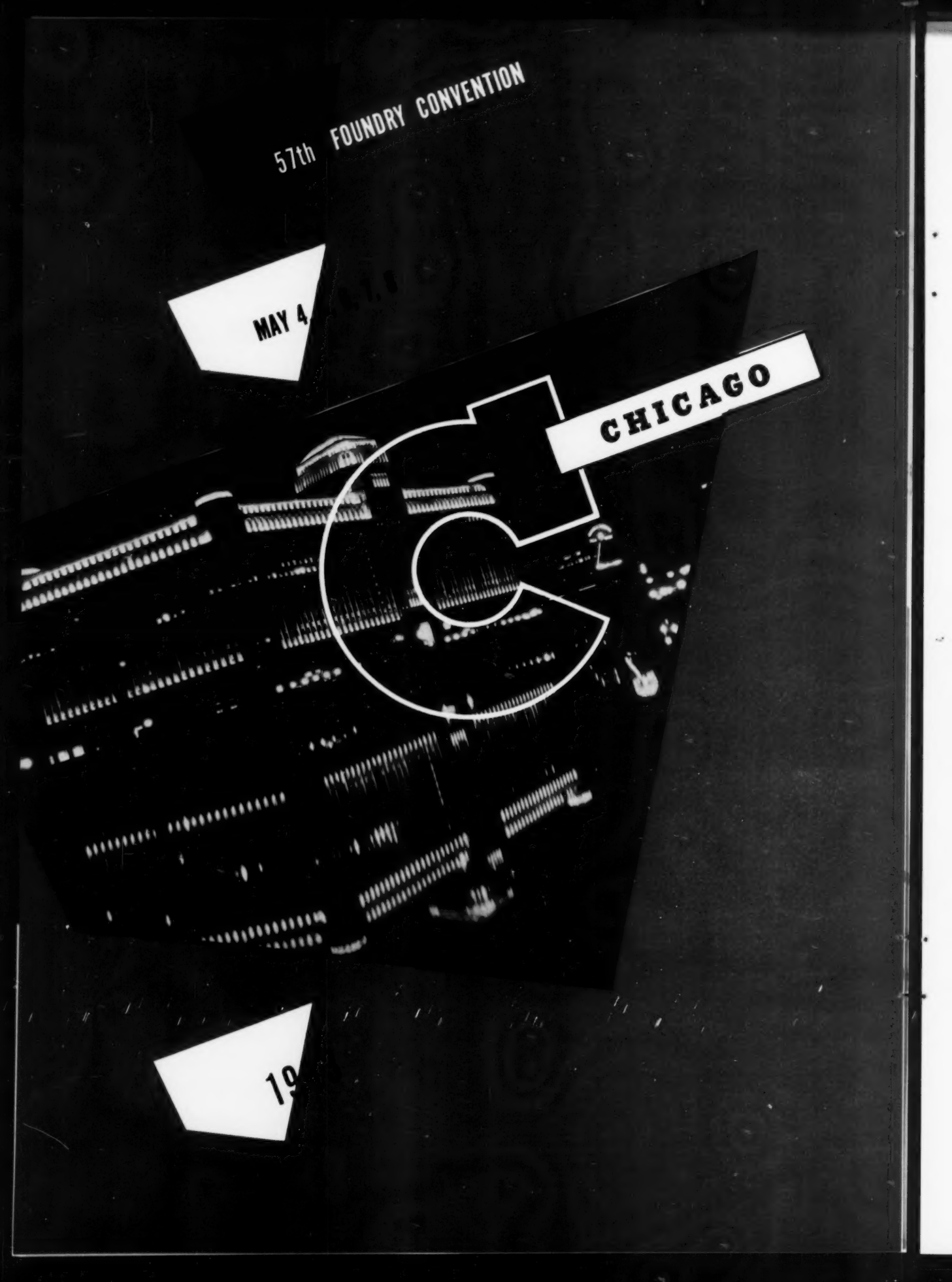
In some 84 papers scheduled for this Convention, the tremendously varied interests of Society members will be up for discussion, and the entire program of A.F.S. activities paraded and inspected. In the past quarter-century the industry has developed rapidly from a craft toward a science, and more and more progressive foundry managers are sending supervisors to keep abreast, to evaluate, and to recommend that which can best be applied to their own operations.

While today's economists conflict in their estimates of business during the months ahead, it still is certain that the foundry that stresses quality, reduces costs and thus is able to price its product "right," is bound to get its due share of any business available.

The 1953 Convention thus gives a true cross-section of the industry's present and future thinking, as well as an evaluation of whether that thinking is on the right track or not.

Herbert F. Scobie

Herbert F. Scobie
Technical Editor


57th FOUNDRY CONVENTION
MAY 4
CHICAGO
19

HOLDING its longest non-exhibit convention, A.F.S. has scheduled five full days of meetings in Chicago for the week of May 4 through 8. Usually limited to four days in non-exhibit years, this year's annual meeting has been extended to provide for the large number of technical papers and the customary round table luncheon meetings and evening shop course sessions. All branches of foundry technology are represented through the meetings sponsored by the Society's eight divisions and the general interest committees.

As in the past, sessions are scheduled for the convenience of foundrymen by grouping those of a given field of interest. This enables Convention-goers to attend the greatest number of meetings in the shortest possible time. Thus, while sand sessions will be held every day of Convention Week, light metals meetings are scheduled for Monday and Tuesday, May 4 and 5, as are sessions on brass and bronze, malleable iron, and education. Heat transfer meetings will be held on Tuesday, May 5. Program of the Pattern Division will be held Tuesday and Wednesday, May 5 and 6.

Safety & Hygiene & Air Pollution Program meetings are concentrated in the middle of the week on May 4, 5, and 6. Sessions sponsored by the Refractories Committee and the Time Study & Methods Committee are set for Wednesday and Thursday, May 6 and 7. Gray iron papers will be presented the last three days of the week, May 6, 7, and 8. Meetings planned by the Cost Committee and the Plant & Plant Equipment Committee will be held on Thursday, May 7. Steel sessions Thursday and Friday round out the week-long program.

The shop course sessions, scheduled for evening to accommodate the maximum number of local shop men but heavily attended by out-of-towners, deviate somewhat from the above schedule. Thus, sand shop and gray iron shop meetings will be held the evenings of May 4, 5, and 7, while brass and bronze shop sessions will be held May 4 and 5. These popular, informal sessions, like the round table luncheons, are highlighted by practical discussions with everyone who wishes taking part in the no-holds-barred, off-the-record give and take of ideas and experiences.

Highlights of the technical program include: the Symposium on Sand Reclamation, sponsored jointly by the Gray Iron, Sand, and Steel Divisions and scheduled for Wednesday, May 6; the Charles Edgar Hoyt Annual Lecture, *"Outstanding Opportunities for the Foundry Industry,"* to be presented Thursday, May 7; the papers of the Plant & Plant Equipment Committee (May 7) on coremaking which continue last year's symposium on molding and coremaking machines; four papers on titanium to be presented the afternoon of Tuesday, May 5; the brass and bronze Fracture Test Symposium Monday afternoon, May 4; and a heavy schedule of sessions on Safety & Hygiene & Air Pollution.

Two major Society activities will be dramatized in displays—the annual A.F.S. Apprentice Contest and the dissemination of information through publications. Now in its 30th year, the apprentice contest will be represented by the entries in the fields of metal and wood patternmaking, and in gray iron, steel, and nonferrous molding.

On display in the Publications Booth will be the more than 60 publications of A.F.S. These cover the field of foundry methods and operations and will include such recently released publications as the *Patternmakers' Manual, A Study of the Principles of Gating as Applied to Sprue-Base Design, Health Protection in Foundry Practice, Copper-Base Alloys Foundry Practice,* and *Symposium on Air Pollution.* In addition, *Statistical Quality Control for Foundries, Glossary of Foundry Terms,* and *Recommended Names for Gates and Risers* will be available by Convention time and on display.

Throughout the Convention are the traditional meetings and social gatherings as well as a program of entertainment for the ladies. Annual Banquet will be held the evening of Wednesday, May 6. National President I. R. Wagner, Electric Steel Castings Co., Indianapolis, Ind., will preside and Dr. George S. Benson, president of Harding College, Searcy, Ark., will speak on *"Education for Free Enterprise."* Also on the banquet program is the annual presentation of A.F.S. Gold Medal Awards and Honorary Life Memberships.

Annual Business Meeting is set for the morning of

A.F.S. Convention

MAY

Tuesday, May 7, National President Wagner will make the Presidential Address and present awards to first place winners in this year's A.F.S. Apprentice Contest. President and vice-president for 1953-54 and five new directors for 1953-56 will be elected at the business meeting. The Hoyt Lecture follows the Annual Business Meeting.

The Canadian Dinner, traditional social gathering of Canadian foundrymen, is to be held the evening of Tuesday, [illegible] Educational Dinner. Past Presidents' [illegible] Thursday, May 7. The [illegible] members of the Society's "Official Family"—will be held the evening of Thursday, May 7.

The ladies' program starts with the A.F.S. Ladies' Tea the afternoon of Monday, May 4, in the Sherman Hotel. On Tuesday there is a luncheon and fashion show at Marshall Field & Co. Ladies will go to the Kungsholm Restaurant for lunch and the puppet opera on Wednesday, while on Thursday they will attend a tea and reception at the Chicago Art Institute. Ladies headquarters will be Parlor M on the Mezzanine floor of the Hotel Sherman.

Plant visits, always an important part of every A.F.S. Convention, have been arranged by the Plant Visitations Committee and foundrymen will be able to plan trips with the aid of committee members who will man the Plant Visitations table near registration booth.

Registration fees this year are $7 for members and $5 for nonmembers. Advance registration cards early in March and many have taken advantage of the opportunity to register in advance. Advance registrants have been mailed their badges and will be able to walk right in. Registration as a member or nonmember is required for all sessions *except the evening shop course meetings.* Company members have also registered in advance many company employees at the members rate, whether the individuals were members of A.F.S. or not. Under a plan instituted several years ago [illegible]

Following is a resume of technical sessions grouped by industry and operations interest. Full details appear in the program starting on page 98.

Light Metals

The Light Metals Division has scheduled five technical sessions on aluminum, magnesium, and titanium and the Light Metals Round Table Luncheon. The latter featuring a discussion of shell molding of the light metals, will take place Monday noon, May 4. Presentation of papers on light metals starts 10:00 a.m. Monday, May 4, with *"Magnesium Sand Casting Alloys Containing Thorium"* and *"Characteristics of High Strength Magnesium Casting Alloy ZK61."* Next session, after the round table luncheon, is at 1:00 p.m., May 4, and features *"Magnesium Alloy Permanent Mold and Semi-Permanent Mold Castings," "Agar Gels in Plaster-Bonded Investment,"* and *"Effect of Casting Fiber on Mechanical Properties of Aluminum-4½% Copper Alloys."*

Tuesday at 10:00 a.m. light metals foundrymen will

hear gating papers entitled *"Practical Foundry Applications of Principles of Ratio Gating"* and *"Velocities and Volume Rates of Metal Flow in Gating Systems."* Final light metals meetings at 2:00 p.m. and 4:00 p.m. Tuesday offer, respectively, *"A Technique for Casting Titanium"* and *"Mechanical Properties of Cast Titanium-Carbon Alloys;"* and *"Evaluation of Mold Materials for Titanium Castings"* and *"Preliminary Survey of Some Metallurgical Bases for a Titanium Castings Industry."*

Brass and Bronze

Program of the Brass & Bronze Division consists of three technical sessions, two shop course meetings, and a round table luncheon. At one of the opening sessions of the Convention, 10:00 a.m., Monday, May 4, a paper on *"Properties of Graphitic Nickel Alloy Castings"* and four brief reports on research now in progress will be presented. The Fracture Test Symposium, with a panel of four experts, will be presented at 2:00 p.m. Monday, May 4. At 8:00 p.m. the same day is the Brass & Bronze Shop Course session on *"Furnace Operation and Practice"* with three speakers covering indirect arc and resistance furnaces, low and high frequency induction furnaces, and coal and coke fired furnaces.

Tuesday, May 5, at 10:00 a.m. there are two papers: *"A Study of Segregation in Bronze Using a Radioactive Technique"* and *"Some Factors Affecting Spherical Type Macro Gas Porosity in 85-5-5-5 Bronze."* The Brass & Bronze Round Table Luncheon at noon features a motion picture on fluid flow in a small cylindrical casting and a discussion of the questions shown on page 102. At 8:00 p.m. the second day, the shop course discussion continues, covering gas and oil fired furnaces, and furnace practice in general.

The Malleable Division plans four sessions in addition to its Round Table Luncheon. At 10:00 a.m. Monday, May 4, are two papers on mechanization, *"Mechanics of Foundry Mechanization"* and *"Multiple Molding in a Malleable Shop."* At 2:00 p.m. the papers are *"Air Furnace Design and Operation"* and *"Effects of Melting Furnace Atmosphere on Casting Properties and Annealability of Malleable Iron."* Topics of the first day's 4:00 p.m. session are *"Influence of Furnace Atmosphere on the Annealing of Malleable Iron"* and *"Gating to Curtail Pouring Rate and Its Effect on Castings."*

Tuesday malleable sessions lead off with *"Graphitization in the Malleable Iron Industry"* and *"First Stage Graphitizing Rates for Electric Furnace Annealing of White Cast Iron"* at 10:00 a.m. *"How Far Should a Malleable Foundry Go in Sand Control"* is the discussion topic at the Malleable Round Table Luncheon Tuesday noon, May 5.

Sand

The Sand Division has four regular sessions, two sessions devoted to a symposium, and three shop course sessions with something scheduled every day of Convention Week. Sponsored in cooperation with the Gray Iron and Steel Division, the Sand Reclamation Symposium meetings are on Wednesday, May 6, 10:00 a.m. and 2:00 p.m. Morning papers are entitled *"Reclamation of Sand by Pneumatic Dry Scrubbing,"* *"Development of Foundry Sand Reclamation,"* and

"Dry Reclamation of Molding Sand for Steel Castings." The afternoon session will feature *"A Wet Method of Sand Reclamation," "Sand Reclamation in a Steel Foundry,"* and *"Sand Reclamation with the Combination System."* These papers cover all types of sand reclamation systems for which operating and cost data are available.

First sand session is at 4:00 p.m. Monday, May 4, with the following papers: *"A General Look at Non-Ferrous Molding Sands," "Factors Involved in Making a Sand Mixture,"* and *"Deformation of Green Molding Sand."* At the first Sand Shop Course session, 8:00 p.m., the discussion topic is *"Pinholes in Castings."* Tuesday, May 5, at 2:00 p.m. the papers are *"Resins and Sands for Shell Molding"* and *"Shell Molding Materials Testing."* At 8:00 p.m., the second shop meeting will feature a round up of ideas on molding process evaluation with the discussion covering green sand molding, permanent mold and die casting, dry sand molding, shell molding, and core sand molding.

The sand session at 2:00 p.m. Thursday, May 7, has three papers: *"Ramming of Molding Sands," "Casting Surface Finish and Flowability of Sand," and "Report of Flowability Committee."* At 8:00 p.m. steel and malleable discussion leaders will deal with *"Hot Properties of Molding Sands and Their Relation to Casting Defects"* at the shop course. *"Induced Flow Process of Baking Oil-Bonded Cores," "Veining Tendencies of Cores,"* and *"Progress Report on High Temperature Sand Research"* will be presented at the 10:00 a.m. Friday, May 8, sand session.

Education

Two sessions and the Educational Dinner are planned by the Educational Division. *"Job Training in the Foundry"* is the topic for the 2:00 p.m. Monday, May 4, session, while *"The Foundry Industry and Formal Education"* will be covered at 2:00 p.m. on Tuesday. The Educational Dinner, with a talk on *"A Chapter Educational Activity Program,"* is set for 7:00 p.m. Tuesday evening.

Gray Iron

Sponsoring more sessions than any other division or committee, the Gray Iron Division has programmed meetings for every day of the week. These include five technical sessions, three shop course meetings, and a round table luncheon, in addition to co-sponsorship of the Symposium on Sand Reclamation. The gray iron program starts Monday evening at 8:00 p.m. with a shop course session on *"Melting Conditions in the Cupola."* Tuesday evening the topic is *"Foundry Calculations and Essential Records."*

Presentation of technical papers starts Wednesday morning at 10:00 a.m. with the official exchange paper from the Institute of British Foundrymen—*"Efficient Methods of Production of Machine Tool Castings"*—and a research report entitled *"Risering of Gray Iron Castings."* At 4:00 p.m. Wednesday, the papers are *"Dephosphorization of Iron in the Basic Cupola"* and *"Acid Cupola Slags and some Relationships with Melting Conditions."*

Discussion at the Gray Iron Round Table Luncheon Thursday noon, May 7, will be on *"Casting Defects."* At 4:00 p.m. Thursday, papers entitled *"Trends for the Relation of Chill Test Depth and Carbon Equivalent of Gray Cast Irons,"* and *"Hardening Characteristics of Induction Heated Ductile Iron"* will be presented. Gray iron shop discussion at 8:00 p.m. will feature *"Practical Aspects of Carbon Control in the Cupola."* The 10:00 a.m. Friday session is a panel discussion on heat treatment of gray iron for the practical foundryman covering fundamentals, annealing for machinability, through hardening, flame hardening, and stress relieving. At 2:00 p.m. the same day, papers are *"Effect of Magnesium on Eutectic Modification and Graphitization of Certain Fe-C Alloys"* and *"Prediction of Mechanical Properties from Chemical Composition for Fully-Annealed Ductile Cast Iron."*

Heat Transfer

The Heat Transfer Committee is sponsoring sessions at 10:00 a.m. and 2:00 p.m. Tuesday, May 5. At the morning session *"Practical Heat Transfer—An Interpretive Report" will be presented.* Two papers to be presented in the afternoon are *"Solidification of Cylinders"* and *"Solidification at Corner and Core Positions."*

Pattern

Two sessions on Tuesday, May 5, and the Pattern Round Table Luncheon Wednesday noon, make up the program of the Pattern Division. At 10:00 a.m. Tuesday, the topic is *"Patterns for Shell Molding,"* while at 4:00 p.m. *"What Research Offers in a Pattern Coating"* will be presented. The round table topic is *"Pattern Problems—Questions and Answers."*

Safety & Hygiene & Air Pollution

Heaviest program it has planned for any A.F.S. Convention has been organized by the Safety & Hygiene & Air Pollution Committee. Four sessions covering the

S & H & AP field have been set up. Tuesday at 4:00 p.m. papers entitled *"What Are Future Air Pollution Prospects for the Foundry Industry?" "Know Your Problem for Your Community,"* and *"Air Pollution Control Equipment Available for the Foundry Industry"* will be presented.

At 10:00 a.m. Wednesday, May 5, the papers are *"Progress Report—A.F.S. Safety & Hygiene & Air Pollution Program"* and *"Noise in the Foundry."* The same day at 4:00 p.m. there will be a discussion of *"Trends of Dust Control—Past, Present, and Future."* At 4:00 p.m. Thursday, emphasis is on safety with *"Positive Benefits of a Safety Program"* and a question and answer panel to which foundrymen are urged to bring their plant safety problems.

Refractories

Sessions on refractories are scheduled for 4:00 p.m. Wednesday and 2:00 p.m. Thursday. Papers on Wednesday are *"Insulating an Electric Furnace Roof," "Correlation of Air Furnace Bottom Temperature to Refractory and Operating Practice in a Cupola-Air Furnace Duplex System,"* and *"Refractories for Indirect Arc Electric Furnaces for Non-Ferrous Melting."* On the following day, *"Gun-Placed Silica Cupola Linings," "Effects of Operating Practice on Refractory Life in the Periodic Air Furnace,"* and *"Carbon Refractories for the Foundry"* will be presented.

Time Study and Methods

Papers on time study and methods will be presented at 4:00 p.m. Wednesday and Thursday. *"Wage Incentive for Cost and Production Control for Indirect Operators"* is scheduled for Wednesday; *"Developing Standard Data Tables for Core Finishing"* and *"Conveyor Molding Standards"* are set for Thursday.

Foundry Costs

Three papers will be presented under the auspices of the Foundry Cost Committee at a session 2:00 p.m. Thursday, May 7. They are: *"Use of Standards in Controlling Costs," "Are Your Costs Reliable?"* and *"A Cost System for Small Jobbing Foundries."*

Steel

The steel program starts with a round table luncheon Thursday and includes three technical sessions. Discussion subjects for the Steel Round Table Luncheon are *"Hot Tear Investigation—A.F.S. Steel Research Progress Report," "Effect of Casting Defects on Service Performance,"* and *"What Are Your Troubles?"* At the 4:00 p.m. session Thursday, papers will be *"Influence of Molding Materials on the Incidence of Hot Tearing"* and *"Progress Made in Fluidity Testing of Molten Metal During the Last Ten Years."*

Steel papers on Friday, May 8, will be presented at 10:00 a.m. and 2:00 p.m. Subjects in the morning are *"Feeding Range of Joined Sections"* and *"Fundamentals of Riser Behavior"*; in the afternoon, *"Performance of Cast and Rolled Steels in Relation to the Problem of Brittle Fracture."*

Plant and Plant Equipment

The plant and plant equipment session Thursday, May 7, extends last year's papers on molding equipment into the field of core making. Featured will be *"Core Making Machines"* and *"Mechanization in Core Making."*

Mailing of preprints of technical papers started April 1 following receipt of the bulk of the preprint request forms sent to all members on March 10. Those who wish preprints of 1953 Convention papers gratis should rush the request form to A.F.S. Headquarters where it will receive prompt attention. Preprints of papers will not be distributed free at the Convention.

This year, as in 1952, discussion of papers at the regular technical sessions will not be recorded by stenotypists. Instead, committee members will act as recorders at the various sessions, making notes of major points and questions brought out and recording names of those who engage in discussion. Accordingly, Convention attendants are urged to prepare written discussion of papers insofar as possible as a convenience to recorders and authors.

GOLD MEDAL *Awards*

William Romanoff

Joseph S. Seaman Gold Medal

"For exceptional contributions to the Society and its Brass and Bronze Division over many years."

Mr. Romanoff graduated from the University of Michigan in [illegible] has been with H. Kramer & Co., Chicago, since 1926, and is now president. He has served on [illegible] committees of many [illegible] tions throughout his business [illegible]

James H. Smith

Pyrm L. Seaman Gold Medal

"For outstanding contributions in the application of engineering principles in foundry practice, and the 1943 Charles Edgar Hoyt Lecture."

General Manager, Lee [illegible] Div., General Motors [illegible] Smith has been active [illegible] the A.F.S. Milwaukee District, helped form the Saginaw Valley Chapter. He was elected a [illegible] Director in 1945.

George J. Barker

"For outstanding contributions to the Society and the Castings Industry in the education of young engineers for greater appreciation of the industry, the casting process, and cast products as engineering materials."

Varied industrial experience preceded George J. Barker's affiliation with the University of Wisconsin in 1921. As Professor of Metallurgical Engineering at Madison he has performed a valuable service for the Foundry Industry.

HONORARY LIFE MEMBERS

I. Richards Wagner

"For outstanding service to the Society as President during the year 1952-53."

Starting his foundry career in 1912, I. R. Wagner rose to the presidency of Electric Steel Castings Co. in 1942. Retiring from that position in 1950, Mr. Wagner has remained on the firm's Board of Directors.

William J. Grede

William H. McFadden Gold Medal

"For outstanding public service bringing great credit upon and broad recognition for the entire Foundry Industry."

Mr. Grede, president of Grede Foundries, Inc., Milwaukee, was the first foundryman to serve as president of the National Association of Manufacturers. He has been particularly influential in the development of foundry cost accounting methods.

Daniel E. Krause

John H. Whiting Gold Medal

"For outstanding contributions to the Society and the Foundry Industry in the field of ferrous metallurgy and research."

As Executive Director, Gray Iron Research Institute, Columbus, Ohio, Mr. Krause has been a constant participant in foundry technical developments. He holds several metallurgical patents and is, in addition to A.F.S., a member of various other technical and scientific societies.

CONVENTION *Speakers*

BANQUET SPEAKER
Dr. George S. Benson

HOYT ANNUAL LECTURER
James H. Smith

James H. Smith

The Charles Edgar Hoyt Annual Lecturer for the 1948 Convention will be James H. Smith, General Manager, Central Foundry Division, General Motors Corporation. His topic will be, "*Outstanding Opportunities for the Foundry Industry*," a speech that will cover five principal subjects: new molding and core making methods, metallurgy of cast iron, heat treatment of cast iron, better manufacturing methods, and better educational programs. Three short color films will illustrate the lecture.

Mr. Smith began with General Motors as a timekeeper in the Buick Division in 1915. He worked there until transferred in 1919 to the Saginaw Products Division, where he advanced until he became General Manager of the Saginaw Malleable Iron Division. In 1945 he was transferred to the Detroit offices of the Corporation as Assistant to the Vice-President in charge of the Accessory Divisions. He remained in that position until assuming his present assignment in 1946.

Hoyt Lecturer Smith has long taken an active part in the operations of many foundry organizations and educational programs. He is a past president and past director of the Malleable Founders' Society, Trustee of the Foundry Educational Foundation, Regent of General Motors Institute, and a past Director of the American Foundrymen's Society.

R. J. Anderson

G. W. Nicholls

Sunday * May 3

5:30-7:00 pm

Presidents Reception
(By invitation)

Monday * May 4

8:30 am

Registration Begins

9:00 am

Ladies Registration Begins

10:00 am

Brass & Bronze

PRESIDING: F. L. Riddell, H. Kramer & Co., Chicago
CO-CHAIRMAN: J. G. Dick, Canadian Bronze Co., Ltd., Montreal

Properties of Graphitic Nickel Alloy Castings
J. T. Eash and G. L. Lee, International Nickel Co., Inc., Bayonne, N. J.

BRASS & BRONZE RESEARCH IN PROGRESS
Mold Interface Reactions
W. B. Scott, National Bearing Div., American Brake Shoe Co., Meadville, Pa.

M. F. Drumm

J. F. Libsch

L. L. Lucas

O. W. Simmons

R. B. Fischer

B. N. Ames

Effect of Casting Defects on Physical Properties
B. N. Ames, New York Naval Shipyard, Brooklyn.

Metal Penetration in Cores
R. B. Fischer, Ingersoll Rand Co., Phillipsburg, N. J.

Manganese Bronze Test Bars
R. A. Colton, Federated Metals Div., American Smelting & Refining Co., Barber, N. J.

Light Metals

PRESIDING: A. T. Peters, Dow Chemical Co., Bay City, Mich.
CO-CHAIRMAN: W. D. Danks, Howard Foundry Co., Chicago.

Magnesium Sand Casting Alloys Containing Thorium
K. E. Nelson, Dow Chemical Co., Midland, Mich.

(Preprint 53-54)
Characteristics of High Strength Magnesium Casting Alloy ZK 61
J. W. Meier, Department of Mines and Technical Surveys, Ottawa, Canada.

Malleable

PRESIDING: W. G. Ferrell, Auto Specialties Co., St. Joseph, Mich.
CO-CHAIRMAN: L. E. Roby, Peoria Malleable Casting Co., Peoria, Ill.

(In this issue)
Mechanics of Foundry Mechanization
R. J. Anderson, Belle City Malleable Iron Co., Racine, Wis.

(March issue)
Multiple Molding in a Malleable Shop
J. G. Kropka, Chain Belt Co., Milwaukee.

(Preprint 53-4)
Effects of Melting Furnace Atmosphere on Casting Properties and Annealability of Malleable Iron—Malleable Research Progress Report
E. A. Lange and R. W. Heine, University of Wisconsin, Madison.

3:00 pm

Official A.F.S. Ladies Tea

4:00 pm

Light Metals

PRESIDING: W. A. Mader, Oberdorfer Foundries, Inc., Syracuse, N. Y.
CO-CHAIRMAN: D. L. LaVelle, American Smelting & Refining Co., Barber, N. J.

(Preprint 53-49)
Magnesium Alloy Permanent Mold and Semi-Permanent Mold Castings
M. E. Gantz, Jr., E. M. Gingerich and R. T. Woods, Aluminum Company of America, Cleveland.

12:00 noon

Light Metals
Round Table Luncheon

PRESIDING: F. P. Strieter, Dow Chemical Co., Midland, Mich.

(Preprint 53-36)
Casting Magnesium Alloys in Shell Molds
N. Sheptak, The Dow Chemical Co., Midland, Mich.

Shell Molding
DISCUSSION LEADERS — Aluminum: J. L. Schmieder, Jr., Oberdorfer Foundries, Inc., Syracuse, N. Y. Magnesium: A. J. Marotta, Utica Radiator Corp., Utica, N. Y.

W. Busby

E. C. Reid

J. McConachie

H. H. Johnson

W. G. Parker

E. M. Gingerich

J. G. Kropka

R. Y. McCleary

R. E. Edelman

H. R. McCurdy

G. H. Curtis

W. C. Winegard

2:00 pm

Brass & Bronze

PRESIDING: W. M. Ball, Jr., R. Lavin & Sons, Cincinnati.
CO-CHAIRMAN: F. L. Riddell, H. Kramer & Co., Chicago.

FRACTURE TEST SYMPOSIUM
PANEL: C. A. Robeck, Gibson & Kirk Co., Baltimore; H. H. Fairfield, Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.; C. K. Faunt, Christensen & Olsen Foundry Co., Chicago; B. N. Ames, New York Naval Shipyard, Brooklyn.

Education

PRESIDING: G. J. Barker, University of Wisconsin, Madison.
CO-CHAIRMAN: W. J. Hebard, Continental Foundry & Machine Co., East Chicago, Ind.

Job Training in the Foundry
SPEAKERS: E. R. Andrews, Hyde Windlass Co., Bath, Maine; T. Miller, Great Lakes Founders & Machine Corp., Ludington, Mich.

Malleable

PRESIDING: C. O. Schopp, Link-Belt Co., Indianapolis, Ind.
CO-CHAIRMAN: N. N. Amrhein, Federal Malleable Co., West Allis, Wis.

Air Furnace Design and Operation
J. E. Rehder, Canada Iron Foundries, Ltd., Montreal.

(Preprint 53-13)
Agar Gels in Plaster-Bonded Investment
H. Rosenthal and S. Lipson, Frankford Arsenal, Philadelphia.

Effect of Casting Fiber on Mechanical Properties of Aluminum—4½% Copper Alloys
W. D. Walther, C. M. Adams, and H. F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass.

Malleable

PRESIDING: M. Tilley, National Malleable & Steel Castings Co., Cleveland.
CO-CHAIRMAN: J. Dvorak, Eberhardt Mfg. Div., Eastern Malleable Iron Co., Cleveland.

(Preprint 53-6)
Influence of Furnace Atmosphere on the Annealing of Malleable Iron
J. T. Bryce, A. Hernandez and F. B. Rote, Albion Malleable Iron Co., Albion, Mich.

Gating to Curtail Pouring Rate and Its Effect on Castings
F. J. McDonald, Central Foundry Div., General Motors Corp., Saginaw, Mich.

Sand

PRESIDING: B. H. Booth, Carpenter Brothers, Inc., Milwaukee.
CO-CHAIRMAN: G. S. Schaller, University of Washington, Seattle.

E. T. Myskowski

F. B. Rote

E. A. Loria

F. W. Jacobs

H. F. Taylor

K. E. Nelson

(Preprint 53-11)
A General Look at Nonferrous Molding Sands
C. A. Robeck, Gibson & Kirk Co., Baltimore, and C. A. Sanders, American Colloid Co., Chicago.

(Preprint 53-18)
Factors Involved in Making a Sand Mixture
D. C. Williams, and D. F. Baker, Ohio State University, Columbus.

(Preprint 53-32)
Deformation of Green Molding Sand
W. G. Parker, Elmira Foundry Co., Elmira, N. Y.

4:30 pm

Ladies Registration Closes

5:00 pm

Registration Closes

6:15 pm

Good Fellowship Party, Non-Ferrous Founders' Society

7:15 pm

Annual Non-Ferrous Dinner, Non-Ferrous Founders' Society

8:00 pm

Brass & Bronze Shop Course

PRESIDING: R. J. Keeley, Ajax Metal Div., H. Kramer & Co., Philadelphia.
CO-CHAIRMAN: H. M. St. John, Crane Co., Chicago.

FURNACE OPERATION AND PRACTICE

Indirect Arc and Resistance Furnaces
B. W. Schafer, Detroit Electric Furnace Div., Kuhlman Electric Co., Bay City, Mich.

Low and High Frequency Induction Furnaces
F. T. Chestnut, Ajax Electrothermic Corp., Ajax Park, N. J.

Coal and Coke Fired Furnaces
R. H. Stone, Vesuvius Crucible Co., Swissvale, Pittsburgh.

Ray Olson

W. S. Pellini

J. A. Cannon

A. L. Graham

Gray Iron Shop Course

PRESIDING: W. Holden, Eaton Manufacturing Co., Vassar, Mich.
CO-CHAIRMAN: E. J. Burke, Hanna Furnace Corp., Buffalo.

Melting Conditions in the Cupola
D. E. Krause, Gray Iron Research Institute, Columbus.

Sand Shop Course

PRESIDING: F. S. Brewster, Harry W. Dietert Co., Detroit.
CO-CHAIRMAN: K. L. Landgrebe, The Wheland Co., Chattanooga.

Pinholes in Castings
W. B. George, R. Lavin & Sons Co., Chicago; L. E. Emery, Marion Malleable Co., Marion, Ind., and G. R. Gardner, Aluminum Company of America, Cleveland.

Tuesday * May 5

8:30 am

Registration Opens

Breakfast—Furnace and Accessories Group, Foundry Equipment Manufacturers Association

9:00 am

Ladies Registration Opens

10:00 am

Heat Transfer

PRESIDING: C. E. Sims, Battelle Memorial Institute, Columbus.
CO-CHAIRMAN: J. B. Caine, Foundry Consultant, Cincinnati.

(Feb. and Mar. issues)
Practical Heat Transfer—Interpretive Report
W. S. Pellini, Naval Research Laboratory, Washington, D. C.

Light Metals

PRESIDING: T. D. Stay, Reynolds Metals Co., Cleveland.
CO-CHAIRMAN: P. J. Petto, Jr., Fairfield Aluminum Co., Fairfield, Iowa.

(March issue)
Practical Foundry Applications of Principles of Ratio Gating
L. L. Lucas, The Wagner Manufacturing Co., Sidney, Ohio.

(Preprint 53-33)
Velocities and Volume Rates of Metal Flow in Gating Systems
W. H. Johnson, H. F. Bishop and W. S. Pellini, Naval Research Laboratory, Washington, D. C.

A Study of Vertical Gating—Light Metals Research Progress Report
J. H. Jackson, J. G. Kura and K. Grube, Battelle Memorial Institute, Columbus, Ohio.

Brass & Bronze

PRESIDING: W. B. Scott, National Bearing Div., American Brake Shoe Co., Meadville, Pa.
CO-CHAIRMAN: R. A. Colton, Federated Metals Div., American Smelting & Refining Co., Barber, N. J.

(In this issue)
A Study in Segregation in Bronze Using a Radioactive Technique
W. C. Winegard, University of Toronto, Toronto, Canada.

(Preprint 53-46)
Some Factors Affecting Spherical Type Macro Gas Porosity in 85-5-5-5 Bronze
R. B. Fischer, Ingersoll-Rand Co., Phillipsburg, N. J.

Malleable

PRESIDING: C. F. Semrau, Illinois Malleable Iron Co., Chicago.
CO-CHAIRMAN: F. A. Czapski, Chicago Malleable Castings Co., Chicago.

(Preprint 53-8)
Graphitization in the Malleable Iron Industry
H. A. Schwartz, W. K. Bock and J. D. Hedberg, National Malleable & Steel Castings Co., Cleveland.

First Stage Graphitizing Rates for Electric Furnace Annealing of White Cast Iron
E. A. Loria, The Carborundum Co., Niagara Falls, N. Y.

Pattern

PRESIDING: V. C. Reid, City Pattern Foundry & Machine Co., Detroit.
CO-CHAIRMAN: H. J. Flaaten, Midwest Pattern Co., Minneapolis.

(In this issue)
Patterns for Shell Molding
R. Olson, Production Foundry & Pattern Co., Chicopee, Mass.

Pattern Equipment for Shell Molding
O. C. Bueg, Arrow Pattern & Engineering Co., Erie, Pa.

12:00 noon

Brass & Bronze Round Table Luncheon

PRESIDING: B. A. Miller, Baldwin-Lima-Hamilton Corp., Philadelphia.

BETTER UNDERSTANDING—BETTER CASTINGS

A Brief Study of Fluid Flow in a Small Cylindrical Casting
J. G. Kura, Battelle Memorial Institute, Columbus.

Malleable Round Table Luncheon

PRESIDING: R. J. Anderson, Belle City Malleable Iron Co., Racine, Wis.
CO-CHAIRMAN: W. A. Kennedy, Grinnell Co., Inc., Providence, R. I.

How Far Should a Malleable Foundry Go in Sand Control
E. E. Woodliff, Foundry Sand Service Engineering Co., Detroit.

1:00 pm

Ladies Luncheon & Fashion Show
Chairman: Mrs. C. V. Nass

2:00 pm

Education

PRESIDING: E. M. Strick, Erie Malleable Iron Co., Erie, Pa.
CO-CHAIRMAN: R. W. Schroeder, University of Illinois, Chicago.

The Foundry Industry and Formal Education
B. D. Claffey, Acme Aluminum Alloys, Inc., Dayton, Ohio. F. G. Sefing, International Nickel Co., Inc., New York.

Foundry Equipment Manufacturers Association Directors Meeting

Heat Transfer

PRESIDING: E. C. Troy, Foundry Engineer, Palmyra, N. J.
CO-CHAIRMAN: F. T. McGuire, Deere & Co., Moline, Ill.

(Preprint 53-19)
Solidification of Cylinders—Heat Transfer Research Progress Report
V. Paschkis, Columbia University, New York.

(Preprint 53-41)
Solidification at Corner and Core Positions
F. A. Brandt, H. F. Bishop and W. S. Pellini, Naval Research Laboratory, Washington, D. C.

A. A. Armstrong

H. E. Bishop

C. T. Marek

J. M. Middleton

Light Metals

PRESIDING: J. H. Jackson, Battelle Memorial Institute, Columbus, Ohio
CO-CHAIRMAN: H. Rosenthal, Frankford Arsenal, Philadelphia.

(In this issue)
A Technique for Casting Titanium
O. W. Simmons and H. R. McCurdy, Frankford Arsenal, Philadelphia.

(Preprint 53-48)
Mechanical Properties of Cast Titanium—Carbon Alloys
O. W. Simmons and R. E. Edelman, Frankford Arsenal, Philadelphia.

Sand

PRESIDING: F. Carl, Fabricast Div., General Motors Corp., Bedford, Ind.
CO-CHAIRMAN: G. P. Phillips, International Harvester Co., Chicago.

(Preprint 53-30)
Resins and Sands for Shell Molding
M. F. Drumm, Monsanto Chemical Co., Springfield, Mass.

(March issue)
Progress Report,
Shell Molding Materials Testing
G. A. Conger, Cambria Foundry & Engineering Div., Stevens Mfg. Co., Ebensburg, Pa.

4:00 pm

Light Metals

PRESIDING: W. A. Dean, Aluminum Co., of America, Cleveland.
CO-CHAIRMAN: R. A. Lubker, Armour Research Foundation, Chicago.

(Preprint 53-52)
Evaluation of Mold Materials for Titanium Castings
R. M. Lang, J. G. Kura and J. H. Jackson, Battelle Memorial Institute, Columbus.

Preliminary Survey of Some Metallurgical Bases for a Titanium Castings Industry
S. V. Arnold, Watertown Arsenal, Watertown, N.Y.; R. F. Malone, H. T. Clark and W. L. Findlay, Rem-Cru Titanium, Inc., Midland, Pa.

Pattern

PRESIDING: E. T. Kindt, Kindt-Collins Co., Cleveland.
CO-CHAIRMAN: J. W. Costello, American Hoist & Derrick Co., St. Paul.

What Research Offers in a Pattern Coating
C. J. Berg, The Sherwin-Williams Co., Chicago.

Safety, Hygiene and Air Pollution

PRESIDING: F. A. Patty, General Motors Corp., Detroit.
CO-CHAIRMAN: J. M. Kane, American Air Filter Co., Louisville.

What Are Future Air Pollution Prospects for the Foundry Industry?
J. M. Kane, American Air Filter Co., Louisville.

Know Your Problem for Your Community
R. T. Greibling, Air Pollution Control Assn., Pittsburgh.

Air Pollution Control Equipment Available for the Foundry Industry
R. T. Pring, American Wheelabrator & Equipment Corp., Mishawaka, Ind.

4:30 pm

Ladies Registration Closes

5:00 pm

Registration Closes

7:00 pm

Canadian Dinner

PRESIDING: J. J. McFadyen, Vice-Pres., Galt Malleable Iron Co., Galt, Ont.

Educational Dinner

PRESIDING: Collins L. Carter, President, Albion Malleable Iron Co., Albion, Mich.

A Chapter Educational Activity Program
H. E. Gravlin, Jr., Ford Motor Co., Dearborn, Mich.

8:00 pm

Brass & Bronze Shop Course

PRESIDING: R. J. Keeley, Ajax Metal Div., H. Kramer & Co., Philadelphia.
CO-CHAIRMAN: H. M. St. John, Crane Co., Chicago.

Furnace Operation and Practice
Gas and Oil Fired Furnaces
J. L. Stroman, Stroman Furnace & Engineering Div. The Petersen Oven Co., Franklin Park, Ill.

Furnace Practices
M. G. Dietl, Schaible Foundry & Brass Co., Cincinnati.

Gray Iron Shop Course

PRESIDING: H. H. Wilder, Vanadium Corp., of America, Detroit.
CO-CHAIRMAN: E. J. Burke, Hanna Furnace Corp., Buffalo.

Foundry Calculations and Essential Records
K. H. Priestley, Vassar Electroloy Products, Inc., Vassar, Mich.

Sand Shop Course

PRESIDING: H. Brown, Solar Aircraft Co., Des Moines, Iowa.
CO-CHAIRMAN: R. H. Olmsted, Whitehead Bros. Co., Conneaut, Ohio.

EVALUATION OF MOLDING PROCESSES
Introduction
H. Brown, Solar Aircraft Co., Des Moines, Iowa.

Green Sand Molding
C. E. Maddick, Massey-Harris, Ltd., Brantford, Ont.

Permanent Mold or Die Casting
W. B. Scott, American Brake Shoe Co., Meadville, Pa.

Dry Sand Molding
G. W. Anselman, Beloit Foundry Co., So. Beloit, Ill.

Shell Molding
J. B. Stazinski, General Electric Co., Lynn, Mass.

Core Sand Molding
G. P. Antonic, Motor Castings Co., Milwaukee.

Wednesday * May 6

8:30 am

Registration Opens

9:00 am

Ladies Registration Opens

10:00 am

Gray Iron

PRESIDING: J. S. Vanick, International Nickel Co., Inc., New York.
CO-CHAIRMAN: F. J. Dost, Sterling Foundry Co., Wellington, Ohio.

(Preprint 53-43)
Risering of Gray Iron Castings—Progress Report on Gray Iron Research
W. A. Schmidt and H. F. Taylor, Massachusetts Institute of Technology, Cambridge.

Efficient Methods of Production of Machine Tool Castings
G. W. Nicholls, Modern Foundries, Ltd., Halifax, England. (Official Exchange paper, Institute of British Foundrymen)

Safety, Hygiene and Air Pollution

PRESIDING: J. G. Liskow, American Air Filter Co., Louisville.
CO-CHAIRMAN: W. W. Dodge, Caterpillar Tractor Co., Peoria.

Progress Report—A.F.S. Safety & Hygiene & Air Pollution Program
J. R. Allan, International Harvester Co., Chicago.

Noise in the Foundry
H. T. Walworth, Lumbermen's Mutual Casualty Co., Chicago.

Symposium on Sand Reclamation

PRESIDING: J. A. Rassenfoss, American Steel Foundries, E. Chicago, Ind.
CO-CHAIRMAN: R. H. Jacoby, The Key Co., East St. Louis, Ill.

Reclamation of Sand by Pneumatic Dry Scrubbing
H. W. Meyer, General Steel Castings Corp., Granite City, Ill.

Development of Foundry Sand Reclamation
C. E. Wenninger, National Engineering Co., Chicago.

R. Carlson

L. L. Martin

J. E. Rehder

J. H. Jackson

H. A. Schwartz

F. W. Shipley

C. A. Robeck

J. B. Caine

D. C. Williams

J. W. Meier

S. F. Carter

W. K. Bock

Dry Reclamation of Molding Sand for Steel Castings
J. A. Cannon, Duncan Foundry & Machine Works, Inc., Alton, Ill.

12:00 noon

Pattern Round Table Luncheon

PRESIDING: A. F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee.
CO-CHAIRMAN: H. K. Swanson, Swanson Pattern & Model Works, E. Chicago, Ind.

Pattern Problems—Questions and Answers

12:00 noon

Board of Directors Luncheon
(Board members only)

Ladies Luncheon and Puppet Opera

Chairman: Mrs. R. P. Schauss

2:00 pm

Symposium on Sand Reclamation

PRESIDING: T. W. Curry, Lynchburg Foundry Co., Lynchburg, Va.
CO-CHAIRMAN: G. M. Etherington, American Brake Shoe Co., Mahwah, N. J.

A Wet Method of Sand Reclamation
R. H. Shurmer and P. C. Wiki, The Hydro-Blast Corp., Chicago.

Sand Reclamation in a Steel Foundry
H. H. Johnson, R. Y. McCleery and G. A. Fisher, National Malleable and Steel Castings Co., Sharon, Pa.

Sand Reclamation with the Combination System
G. H. Curtis, Nichols Engineering & Research Corp., New York.

4:00 pm

Gray Iron

PRESIDING: H. A. Deane, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.
CO-CHAIRMAN: G. L. Richter, Farrel-Birmingham Co., Ansonia, Conn.

(March issue)
Dephosphorization of Iron—Basic Cupola Operation
J. E. Bolt, Lt. USNR, Bureau of Ships, Washington, D. C.

Acid Cupola Slags and Some Relationships with Melting Conditions
S. F. Carter and Ralph Carlson, American Cast Iron Pipe Co., Birmingham, Ala.

Refractories

PRESIDING: C. H. Wyman, Burnside Steel Foundry Co., Chicago.
CO-CHAIRMAN: R. A. Witschey, A. P. Green Fire Brick Co., Chicago.

(February issue)
Insulating an Electric Furnace Roof
C. C. Spencer, Electric Steel Castings Co., Indianapolis.

(Preprint 53-45)
Correlation of Air Furnace Bottom Temperature to Refractory and Operating Practice in a Cupola-Air Furnace Duplex System
F. W. Jacobs and J. S. Lawrence, Jr., Texas Foundries, Inc., Lufkin, Texas.

Refractories for Indirect Arc Electric Furnaces for Non-Ferrous Melting
M. G. Dietl, Schaible Foundry & Brass Co., Cincinnati.

Safety, Hygiene and Air Pollution

PRESIDING: J. G. Liskow, American Air Filter Co., Louisville, Ky.
CO-CHAIRMAN: W. W. Dodge, Caterpillar Tractor Co., Peoria, Ill.

TRENDS OF DUST CONTROL—PAST, PRESENT AND FUTURE
K. J. Caplan, Consultant, St. Louis; K. M. Smith, Caterpillar Tractor Co., Peoria; A. G. Granath, National Engineering Co., Chicago.

Timestudy and Methods

PRESIDING: Dean Van Order, Burnside Steel Foundry Co., Chicago.
CO-CHAIRMAN: J. J. Farkas, Cincinnati Milling Machine Co., Cincinnati.

(Preprint 53-1)
Wage Incentive for Cost and Production Control for Indirect Operators
C. J. Pruet, McWane Cast Iron Pipe Co., Birmingham, Ala.

4:30 pm

Ladies Registration Closes

5:00 pm

Registration Closes

6:15 pm

Annual Banquet Reception
(For speakers table)

7:00 pm

Annual Banquet

PRESIDING: I. R. Wagner, President, A.F.S.

Presentation of A.F.S. Gold Medal Awards and Honorary Life Memberships.

SPEAKER: Dr. George S. Benson, President, Harding College, Searcy, Arkansas.

Education for Free Enterprise

Thursday • May 7

8:00 am

Past Presidents Breakfast
(Past Presidents only)

PRESIDING: Walton L. Woody, National Malleable & Steel Castings Co., Cleveland.

9:00 am

Registration Opens

Ladies Registration Opens

10:00 am

A.F.S. Annual Business Meeting

PRESIDING: A.F.S. National President, I. R. Wagner.

President's Annual Address

Apprentice Contest Awards

Election of Officers and Directors

11:00 am

Charles Edgar Hoyt Annual Lecture

Outstanding Opportunities for the Foundry Industry

James H. Smith, General Manager, Central Foundry Div., General Motors Corporation, Saginaw, Mich.

12:00 noon

Ladies Registration Officially Closes

Gray Iron Round Table Luncheon

PRESIDING: W. W. Levi, Lynchburg Foundry Co., Radford, Va.

Casting Defects
W. A. Hambley, Chas. A. Krause Milling Co., Birmingham, Mich.

Steel Round Table Luncheon

PRESIDING: J. B. Caine, Foundry Consultant, Cincinnati.
CO-CHAIRMAN: Victor E. Zang, Unicast Corp., Toledo, Ohio.

Hot Tear Investigation
C. H. Wyman, Burnside Steel Foundry Co., Chicago.

Effect of Casting Defects on Service Performance

What Are Your Troubles?—Let's Discuss Them

2:00 pm

Plant and Plant Equipment

PRESIDING: J. Thomson, Continental Foundry & Machine Co., East Chicago, Ind.
CO-CHAIRMAN: H. W. Johnson, Wells Manufacturing Co., Skokie, Ill.

Core Making Machines
L. B. Koenig, J. I. Case Co., Racine.

Mechanization in Core Making
H. C. Weimer, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago. (Motion Picture.)

Foundry Costs

PRESIDING: R. L. Lee, Grede Foundries, Inc., Milwaukee.
CO-CHAIRMAN: C. E. Westover, Westover Engineers, Milwaukee.

(Preprint 53-44)
Use of Standards in Controlling Costs
William Busby, Texas Foundries, Inc., Lufkin, Texas.

(Preprint 53-59)
Are Your Costs Reliable
R. T. Lewis, Keen Foundry Co., Griffith, Ind.

A Cost System for Small Jobbing Foundries
R. W. McDonnell, Letson & Burpee, Ltd., Vancouver, B. C.

Refractories

PRESIDING: W. R. Jaeschke, The Whiting Corp., Harvey, Ill.

CO-CHAIRMAN: R. P. Schauss, Werner G. Smith, Inc., Chicago.

Gun Placed Silica Cupola Linings
T. E. Barlow and P. D. Humont, International Minerals & Chemical Corp., Chicago.

Effects of Operating Practice on Refractory Life in the Periodic Air Furnace
C. F. Semrau, Illinois Malleable Iron Co., Chicago.

Carbon as a Refractory
J. V. Nolan and T. J. Wilde, National Carbon Co., New York.

Sand

PRESIDING: J. B. Caine, Foundry Consultant, Cincinnati.
CO-CHAIRMAN: W. S. Pellini, Naval Research Laboratory, Washington, D. C.

(Preprint 53-39)
Ramming of Molding Sands
H. W. Dietert and A. L. Graham, Harry W. Dietert Co., Detroit.

(In this issue)
Casting Surface Finish and Flowability of Sand
H. H. Fairfield and James McConachie, William Kennedy & Sons, Ltd., Owen Sound, Ont.

(Preprint 53-24)
Report of Flowability Committee
J. B. Caine, Foundry Consultant, Cincinnati.

2:30 pm

Ladies Tea and Reception

4:00 pm

Gray Iron

PRESIDING: D. E. Krause, Gray Iron Research Institute, Columbus, Ohio.
CO-CHAIRMAN: F. T. McGuire, Deere & Co., Moline, Ill.

(Preprint 53-28)
Trends for the Relation of Chill Test Depth and Carbon Equivalent of Gray Cast Irons
E. A. Loria, The Carborundum Co., Niagara Falls, N. Y.

(Preprint 53-31)
Hardening Characteristics of Induction Heated Ductile Iron
E. P. Rowady, General Electric Co., Schenectady, W. J. Murphy and J. F. Libsch, Lehigh University, Bethlehem, Pa.

Safety, Hygiene and Air Pollution

PRESIDING: J. W. Young, International Harvester Co., Chicago.
CO-CHAIRMAN: M. F. Biancardi, Allis-Chalmers Mfg. Co., Milwaukee.

Positive Benefits of a Safety Program
F. W. Shipley, Caterpillar Tractor Co., Peoria.

Question and Answer Panel: A.F.S. Safety Committee. Bring in your Plant Safety Problems and Get an Authoritative Answer from Experts.

Steel

PRESIDING: C. B. Jenni, General Steel Castings Co., Eddystone, Pa.
CO-CHAIRMAN: J. R. Goldsmith, Crane Co., Chicago.

The Influence of Molding Materials on the Incidence of Hot Tearing
J. M. Middleton, British Steel Castings Research Association, Sheffield, England—To be presented by C. W. Briggs, Steel Founders' Society of America, Cleveland.

Progress Made in Fluidity Testing of Molten Metal During the Last Ten Years
A. I. Krynitsky, (Retired) National Bureau of Standards, Washington, D. C.—To be presented by J. H. Schaum, National Bureau of Standards, Washington, D. C.

Timestudy and Methods

PRESIDING: J. A. Westover, Westover Engineers, Milwaukee.

CO-CHAIRMAN: H. R. Williams, Williams Management Engineering, Milwaukee.

(Preprint 53-29)
Developing Standard Data Tables for Core Finishing
L. L. Martin, Sterling Foundry Co., Wellington, Ohio.

(Preprint 53-16)
Conveyor Molding Standards
E. C. Reid, Ford Motor Co. of Canada, Ltd., Windsor, Ont.

G. A. Fisher

M. E. Gantz

H. W. Dietert

H. H. Fairfield

H. Rosenthal

C. Wenninger

5:00 pm

Registration Closes

7:00 pm

A.F.S. Alumni Dinner
(For A.F.S. Alumni)

PRESIDING: Walter L. Seelbach, Superior Foundry, Inc., Cleveland.

Israel and Its Industry
H. Bornstein, Deere & Co., Moline, Ill.

8:00 pm

Gray Iron Shop Course

PRESIDING: W. W. Levi, Lynchburg Foundry Co., Radford, Va.
CO-CHAIRMAN: E. J. Burke, Hanna Furnace Corp., Buffalo.

Practical Aspects of Carbon Control in the Cupola
A. J. Dublo, Sterling Foundry Co., Wellington, Ohio.

Sand Shop Course

PRESIDING: R. H. Jacoby, The Key Co., East St. Louis, Ill.
CO-CHAIRMAN: F. E. Kurtz, Electrical Steel Castings Co., Indianapolis.

Hot Properties of Molding Sands and Their Relation to Casting Defects

STEEL: H. W. Meyer, General Steel Castings Corp., Granite City, Ill.
MALLEABLE: B. C. Yearley, National Malleable & Steel Castings Co., Cicero, Ill.

Friday * May 8

9:00 am

Registration Opens

10:00 am

Gray Iron

PRESIDING: G. A. Timmons, Climax Molybdenum Co., Detroit.
CO-CHAIRMAN: R. A. Clark, Electro Metallurgical Div., Union Carbide & Carbon Co., Detroit.

PANEL DISCUSSION ON HEAT TREATMENT OF GRAY IRON FOR THE PRACTICAL FOUNDRYMAN

The Fundamentals of Heat Treatment of Gray Cast Iron
J. E. LaBelle, Detroit Diesel Engine Div., GMC, Detroit.

Annealing Iron Castings for Machinability
A. W. Demmler, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.

(In this issue)
Through Hardening of Gray Iron
A. A. Armstrong, Thompson Products, Inc., Cleveland.

Flame Hardening Cast Iron
M. R. Scott, Detroit Flame Hardening Co., Detroit.

Stress Relieving Gray Iron
J. H. Schaum, National Bureau of Standards, Washington, D. C.

Sand

PRESIDING: E. C. Zirzow, Werner G. Smith, Inc., Cleveland.
CO-CHAIRMAN: H. W. Meyer, General Steel Castings Corp., Granite City, Ill.

(Preprint 53-9)
Induced Flow Process of Baking Oil-Bonded Cores
C. T. Marek, Purdue University, Lafayette, Ind., and R. J. Wimmert, Air Reduction Corp., Union, N. J.

(Preprint 53-37)
Veining Tendencies of Cores—Committee B-J Report
H. H. Fairfield, William Kennedy & Sons, Ltd., Owen Sound, Ont.

Sand Research—Progress Report
R. G. Thorpe, Cornell University, Ithaca, N. Y.

Steel

PRESIDING: A. H. Suckow, Symington-Gould Corp., Depew, N. Y.
CO-CHAIRMAN: K. Fritz, Bucyrus-Erie Co., So. Milwaukee, Wis.

(Preprint 53-14)
Feeding Range of Joined Sections
E. T. Myskowski, H. F. Bishop and W. S. Pellini, Naval Research Laboratory, Washington, D. C.

Fundamentals of Riser Behavior
C. M. Adams and H. F. Taylor, Massachusetts Institute of Technology, Cambridge.

12:00 noon

Registration Officially Closes

2:00 pm

Gray Iron

PRESIDING: H. L. Ullrich, Sacks-Barlow Foundries, Newark, N. J.
CO-CHAIRMAN: G. P. Phillips, International Harvester Co., Chicago.

Effect of Magnesium on Eutectic Modification and Graphitization of Certain Fe-C Alloys
H. W. Weart and R. W. Heine, University of Wisconsin, Madison.

(Preprint 53-51)
Prediction of Mechanical Properties from Chemical Composition for Fully-Annealed Ductile Cast Iron
C. C. Reynolds, C. M. Adams, and H. F. Taylor, Massachusetts Institute of Technology, Cambridge.

Steel

PRESIDING: A. W. Demmler, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.
CO-CHAIRMAN: J. Neff, American Steel Foundries, E. Chicago, Ind.

(Preprint 53-3)
Performance of Cast and Rolled Steels in Relation to the Problem of Brittle Fracture
W. S. Pellini, F. A. Brandt and E. E. Layne, Naval Research Laboratory, Washington, D. C.

Engineering Aspects of Centrifugal Casting
J. F. Wallace, Watertown Arsenal, Watertown, Mass.

4:00 pm

57TH ANNUAL MEETING OFFICIALLY CLOSES

BRASS & BRONZE ROUND TABLE LUNCHEON
TUESDAY, MAY 5

Program for the luncheon includes showing of the Brass & Bronze Ingot Institute film on gating and discussion of the questions below. The first question relates directly to the film.

Questions for discussion are:

1. How does the gating system affect the soundness of copper-base alloy castings?
   (a) Do all copper-base alloys follow these principles?
   (b) Does melting practice influence the effectiveness of this gating technique?
   (c) Do molding materials influence the effectiveness of the gating technique?
2. Is it possible to make pressure castings from the aluminum and manganese bronzes?
3. Good practice dictates some standard of quality control in all brass and bronze foundries.
   (a) How can this be set up for small, as well as large foundries?
   (b) Are simple standards of work sufficient?
   (c) Are laboratory facilities required?
4. After making a certain casting for a period of time, a considerable amount of scrap was obtained through no apparent change in practice. Is there a standard correction procedure to follow?
5. What benefits can be derived from the use of oxidizers, deoxidizers, covers or fluxes, when melting?
   (a) Tin bronzes?
   (b) Yellow brass?
   (c) High strength bronzes?
   (d) Silicon bronzes?
   (e) Nickel silvers?

A.F.S. Acquires Site For Headquarters Building

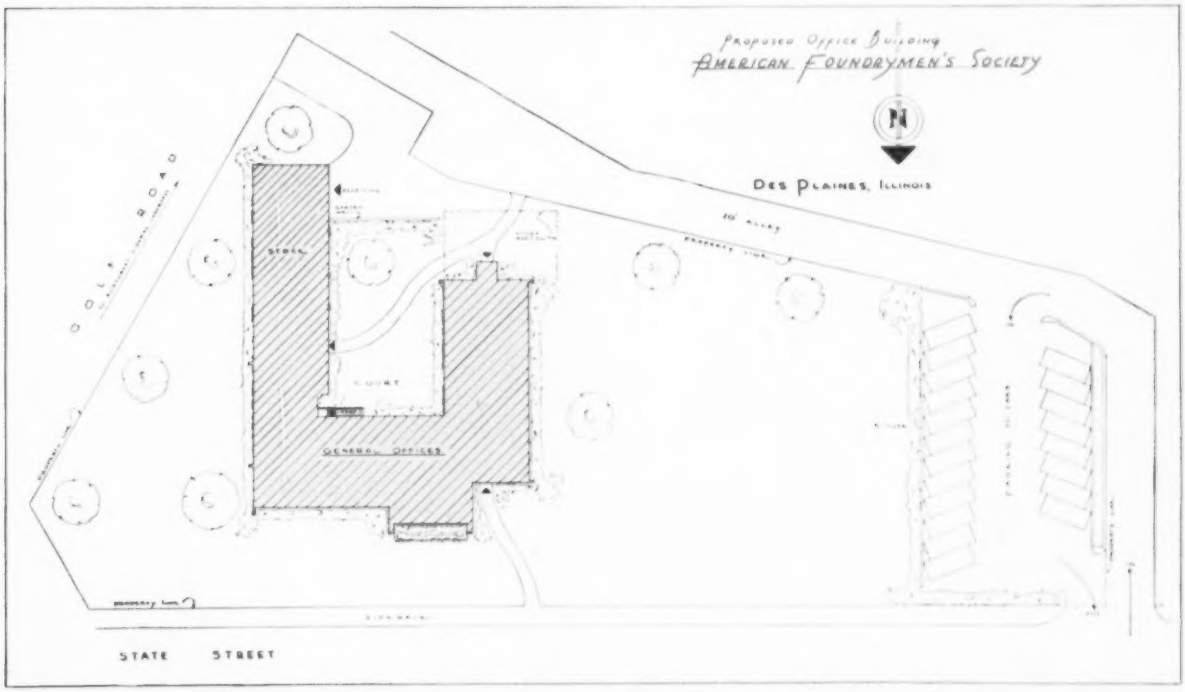
By March 19 all negotiations were completed for the Society's purchase of a property in Des Plaines, Ill. on which the new Headquarters Building of A.F.S. will be located. The site is located immediately adjacent to the Cumberland Station on the Chicago & Northwestern Railroad suburban line, a short distance from the downtown area of Des Plaines.

Semi-triangular in shape, the property consists of nearly two acres, bounded on the east by the Wolf Road-Golf Road underpass beneath Northwest Highway. As laid out, the Headquarters building will face north on State St., which at that point is a two-lane divided boulevard, thus providing unbroken view for a considerable distance.

The site purchased is not the original site contemplated after the Board of Directors approved a recommendation of the Housing Committee to construct a new Headquarters building in a suburb of Chicago. The previously considered site could not be rezoned for the purposes of the Society, but the site purchased is considered in every way superior to the disputed location.

An office building comprising approximately 9500 sq. ft. on one floor has been designed for and approved by the Action Subcommittee, floor plans now being worked out between the National Office Staff and F. C. Riecks of Ford Motor Co., Dearborn, Mich. The new structure will include a large combination Library and Conference Room, various private offices, separate room for addressograph and mailing lists, and a considerably larger section for the storage of A.F.S. publi-

Continued on page 200



Plot plan for the new A.F.S. Headquarters Building to be erected in Des Plaines, Ill. at the intersection of Northwest Highway with the Golf Road-Wolf Road underpass. The U-shaped building contemplated will face north across State St. and will provide off-the-street parking, trucking approach from the rear, and a light and attractive outlook.

National

OFFICERS *and* DIRECTORS

of the American Foundrymen's Society

President
I. R. Wagner
Electric Steel Castings Co.
Indianapolis

Vice-President
Collins L. Carter
Albion Malleable Iron Co.
Albion, Mich.

J. O. Klein

H. G. Robertson

W. J. Klayer

James Thomson

Term expires 1953

J. J. McFadyen
Galt Malleable Iron Co., Ltd., Galt, Ont., Canada

J. O. Ostergren
Lakey Foundry & Machine Co., Muskegon, Mich.

Walter L. Seelbach
Superior Foundry, Inc., Cleveland

Frank W. Shipley
Caterpillar Tractor Co., Peoria, Ill.

James Thomson
Continental Foundry & Machine Co., East Chicago, Ind.

E. C. Troy
Foundry Engineer, Palmyra, N. J.

Term expires 1954

Harry W. Dietert
Harry W. Dietert Co., Detroit

Albert L. Hunt
National Bearing Div., American Brake Shoe Co., St. Louis, Mo.

J. T. MacKenzie
American Cast Iron Pipe Co., Birmingham, Ala.

M. J. O'Brien, Jr.
Vulcan Iron Works, Wilkes-Barre, Pa.

Andrew M. Ondreyco
General Metals Corp., Oakland, Calif.

Term expires 1955

M. A. Fladoes
Sivyer Steel Casting Co., Milwaukee

W. J. Klayer
Aluminum Industries, Inc., Cincinnati

J. O. Klein
Texas Foundries, Inc., Lufkin, Texas

A. D. Matheson
French & Hecht Div., Kelsey-Hayes Wheel Co., Davenport, Iowa

H. G. Robertson
American Steel Foundries, Alliance, Ohio

Walter L. Seelbach

A. D. Matheson

Martin J. O'Brien, Jr.

M. A. Fladoes

E. C. Troy

Frank W. Shipley

J. O. Ostergren

J. J. McFadyen

A. L. Hunt

Harry W. Dietert

James T. MacKenzie

A. M. Ondreyco

For the LADIES

■ While their husbands are assimilating technical ideas and information, the ladies attending the 57th Annual A.F.S. Convention will enjoy a round of social activities especially planned for their entertainment. They include the Official A.F.S. Ladies Tea, a fashion show, a puppet opera, two luncheons, and a tea and reception in an art gallery.

Ladies headquarters during the Convention will be in Parlor M on the Mezzanine floor of the Hotel Sherman. Registration is from 9:00 a.m. to 4:30 p.m. on May 4, 5, and 6, and 9:00 a.m. to 12:00 noon on May 7.

First on the ladies entertainment program is the traditional tea at which the Society plays host. Scheduled for Monday, May 4, 3:00 to 5:00 p.m., the Official A.F.S. Ladies Tea will be held in the New Mezzanine Room of the Hotel Sherman.

Luncheon and a fashion show in the Walnut Room of Marshall Field & Co. make up the program for Tuesday, May 5. Luncheon starts at 1:00 p.m.; the fashion show runs from 2:00 to 4:00 p.m.

The Kungsholm Restaurant is scene of the Wednesday entertainment. Following a smorgasbord luncheon at 12:00 noon, ladies will be entertained from 2:00 to 4:00 p.m. with an operatic program in which the miniature actors and actresses are puppets.

The formal program for the ladies concludes on Thursday, May 7, with a tea and reception (2:30-4:30 p.m.) in the Decorative Arts Galleries of the Art Institute of Chicago.

In addition to their special program, many of the ladies will attend other Convention events of interest to them. These include:

ANNUAL BANQUET—Wednesday, May 6, 7:00 p.m., Terrace Casino, Hotel Morrison. Dr. George S. Benson, president, Harding College, Searcy, Ark., will speak on *"Education for Free Enterprise."* A.F.S. Gold Medal Awards and Honorary Life Memberships—top honors in the foundry world—will be presented.

BUSINESS MEETING—Thursday, May 7, 10:00 a.m., Grand Ballroom, Hotel Sherman. Features include National President I. R. Wagner's address, presentation of A.F.S. Apprentice Contest awards, and election of officers and directors.

CHARLES EDGAR HOYT ANNUAL LECTURE—Thursday, May 7, 11:00 a.m., Grand Ballroom, Hotel Sherman. Speaker this year is James H. Smith, general manager, Central Foundry Div., General Motors Corp., Saginaw, Mich.; his subject, *"Outstanding Opportunities for the Foundry Industry."*

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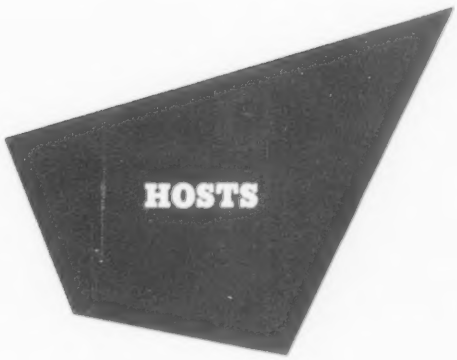

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HOSTS *Continued*

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■ With hospitality typical of the industry, Chicago-area foundrymen are opening their plants to those who attend the 1953 A.F.S. Convention, May 4 through 8.

Registration for plant visitations will take place on the Mezzanine of the Sherman Hotel at the Plant Visitations desk. Foundrymen are urged to register for plant tours at least one day before the visit so plants can arrange for guides. **The host plants have requested that there be no variations in the scheduled visiting hours.**

The plants listed below will be open to visitors during this year's A.F.S. Convention:

Accurate Match Plate Co. 1847 W. Carroll Ave., Chicago 12. May 6 through 8, 10:00 a.m. and 2:00 p.m.

Accurate Metal Laboratories. 2454 W. 38th St., Chicago 32. May 4 through 8, any time. Chemical and spectrographic laboratories analyzing metals.

Allied Steel Castings Co. 146th and Lincoln St., Harvey, Ill. About 18 miles from Loop on Illinois Central Electric Lines. Open hearth steel castings.

American Manganese Steel Div., American Brake Shoe Co. Chicago Heights, Ill. About 25 miles from Loop on Illinois Central Electric Lines. May 5, 1:00 p.m. Electrically melted manganese and heat and acid resisting steel castings.

American Steel Foundries, Indiana Harbor Works. Canal and Dock, East Chicago, Ind. May 7, 2:00 p.m. only. About 20 miles from Loop on Chicago South Shore & South Bend Electric Line. Electric furnaces, 1 acid and 1 basic. Railroad castings. Research Laboratory.

Arrow Pattern Foundry Co., Inc. 2710 W. Lake St., Chicago 12. May 4 through 8 at any time.

Beardsley & Piper Division. 2541 North Keeler Ave., Chicago 39. May 4-8, inclusive; 9:30 a.m. to 12 noon, and 2:30 to 4 p.m., daily. Manufacture of complete line of foundry molding, sand conditioning and mulling machinery.

Burnside Steel Foundry Co. 1300 E. 92nd St., Chicago 19. May 6 through 8, 1:00 p.m. Electric steel castings. Jobbing. Heat treating plant.

Chicago Hardware Foundry Co. North Chicago, Ill. About

continued on following page

CONVENTION PLANT VISITATION

40 miles from the Loop. Take Chicago, North Shore and Milwaukee Electric Line every hour on the hour to North Chicago, May 5 and 6 only. Signs direct to the plant. Gray iron, brass and aluminum castings. Mechanized and floor work. Gray iron castings from fraction of pound to 1200 lb or more, all jobbing work. Wet and dry porcelain enameling and electroplating.

Chicago Malleable Castings Co. 1225 W. 120th St., Chicago 43. May 6 and 7, 10:00 a.m. only. Duplex malleable iron. All types of castings.

Chicago Steel Foundry Co. 3720 S. Kedzie Ave., Chicago 32. Two acid electric arc furnaces. Mechanized. Carbon and alloy steels including heat and acid resisting castings.

L. A. Cohn & Brother, Inc. 5429 West Roosevelt Road, Cicero, Ill. Copper-brass alloy ingot. May 6 only.

Continental Foundry & Machine Co. East Chicago, Ind. About 20 miles from Loop on South Shore Electric Line. May 5, 6, and 7, 9:00 a.m. and 1:00 p.m. Open hearth and electric melting. Very heavy machinery castings and rolls for steel mill application.

Crane Company. 4100 S. Kedzie Ave., Chicago 32. Wednesday May 6, 9:00 a.m. at plant, Tower entrance. *Can admit only adult males who are American or Canadian citizens.*

MALLEABLE PLANT: Very recently mechanized. Make malleable pipe fittings.

BRASS FOUNDRY: Brass plumbing fittings and valves. Both the malleable and brass foundries.

Elesco Smelting Corp. 3401 S. Lawndale, Chicago 2. Copper-base alloy ingot. May 6 only.

Federated Metals Div., American Smelting & Refining Co. Whiting, Illinois. Copper-base alloy ingots, lead, tin, zinc alloys, solder and babbitt. May 6 only. Busses will leave at 10:00 a.m. from Hotel Sherman. Lunch served and visitors returned to the hotel.

Ferguson & Lange Foundries, Inc. 1039 Willow St., Chicago 14. May 7, 1:00 to 3:00 p.m. only. General jobbing gray iron, 30 tons per day. Slinger, floor and bench molding. Machine tool and miscellaneous castings.

Ford Motor Co., Aircraft Engine Division, 7401 South Cicero Ave., Chicago 29. May 4 and 5 only, 9 a.m. and 1 p.m. Plant reached by airport limousine to Midway airport and taxi to plant. Believed to be largest magnesium foundry in world. Highly mechanized magnesium airplane castings for reciprocating and jet engines. All moldings in dry sand (core sand).

Griffin Wheel Co. 445 N. Sacramento Ave., Chicago 12. May 6, 9:00 to 11:00 a.m. only. Chilled railroad car wheels.

Hansell-Elcock Co. 485 West 23rd Place, Chicago 16. May 5 and 7, 9:30 to 12:00 a.m. only. Jobbing and semi-production, 70 tons per day, slinger, rollover, etc. Heavy castings such as machine tool, diesel engine and machinery castings.

Harbison Walker Refractories Co. East Chicago, Ind. May 4 through 8. Manufacture silica refractories.

Benj. Harris & Co. Chicago Heights, Ill. Copper-base alloy ingot. May 6 only. Busses will leave at 10:00 a.m. from Hotel Sherman. Lunch will be served and visitors returned by bus to the hotel.

Illinois Clay Products Co. Joliet, Ill. About 35 miles from Loop. May 5 and 6. Makers of refractories and foundry clays. Inquire at Plant Visitation desk for details.

Illinois Institute of Technology and Armour Research Foundation. INSTITUTE: 3300 S. Federal St., Chicago 6. May 4 through 8, 9:00 a.m. to 5:00 p.m. Instruction facilities and laboratories for engineering and scientific courses. FOUNDATION: 35 W. 33rd St., Chicago 6. May 6, 9:30 a.m., 11:00 a.m., 1:30 p.m., and 4:00 p.m. Industrial research projects and scientific investigations for industrial and governmental clients.

Illinois Malleable Iron Co. 1801 W. Diversey Parkway, Chicago 14, May 6, 10:30 a.m. and 2:30 p.m. only. Duplex malleable iron. All types of castings.

International Harvester Co., Malleable Foundry, McCormick Works. Blue Island and Western Ave., Chicago 8. May 7, 1:30 p.m. only. Register at Malleable gate, 28th & Western, west side of street. Batch and duplex (cupola-air furnace) melting. Small agricultural implements and heavy automotive castings.

International Harvester Co., Tractor Works, 2600 West 31st Blvd., Chicago 8. May 8 only, 9 a.m. Slingers and molding machines making sleeves, heads, cylinders and miscellaneous parts for industrial power application. Also, a portion of the machine shop, including new induction hardening facilities.

International Molding Machine Co. W. 31st and Belt R.R., LaGrange, Ill. About 15 miles from Loop by elevated and bus. May 4 through 8, 8:00 a.m. to 5:00 p.m.

Charles C. Kawin Co. 431 S. Dearborn St., Chicago 5, May 4 through 8. Afternoons only. Analytical chemists and metallurgists.

H. Kramer & Co. 1339 West 21st St., Chicago 8. Copper-base alloy ingot. May 6 only.

R. Lavin & Sons, Inc. 3426 S. Kedzie Ave., Chicago 23. Copper and aluminum-base alloy ingot. May 6 only.

Lindberg Engineering Co. 2450 W. Hubbard St., Chicago 12. May 7, 2:00 p.m. Heat treating furnaces and equipment.

Link-Belt Co. 300 W. Pershing Road, Chicago 9. May 4 through 8, 10:00 a.m. and 2:00 p.m. Gray iron and convertor steel melting, about 40 tons each per day. Heavy machinery and power shovel castings.

Love Brothers. Aurora, Ill. About 40 miles from the Loop on the Burlington Railroad. May 6 and 7, 2:00 p.m. Heavy general machinery jobbing.

National Malleable & Steel Castings Co. 1400 S. Laramie Ave., Cicero 50, Ill. May 4 through 8, 1:30 p.m. only. Duplex malleable and electric steel castings. Highly mechanized.

Nichol Straight Foundry Co. 3174 Archer Ave., Chicago 8. May 4 through 8, 9:30 a.m. Jobbing machinery castings, squeezer, rollover and floor molding. About 15 tons per day.

Pettibone-Mulliken Corp. 4710 W. Division St., Chicago, May 6, 7, and 8 from 9:30 a.m. to 12 noon daily. Enter at Cicero Ave. gate. One acid and two basic arc furnaces. Hadfield manganese steel castings.

Thor Corp. 2115 South 54th Ave., Chicago 50. May 5, 6, and 7, 9:00 a.m. Washing machine and home appliance castings. About 30 tons. Mechanized and continuous pouring.

University of Illinois, Chicago Branch. Navy Pier. May 4 and 6 only, 1:00 p.m. Instruction facilities and laboratories.

Western Electric Co. 22nd and Cicero Ave., Chicago 23. Use Gate 1, Cicero Ave. and 24th Court. May 5 and 7, 2:00 p.m. Melt 25 tons of gray iron plus aluminum and brass. Light gray iron castings for electrical and telephone industries. Mechanized.

Western Metal Co. 3201 S. Kedzie Ave., Chicago 23. Copper and aluminum-base ingot. May 6 only.

1953 Convention

PREPRINTS

Each year prior to the Annual A.F.S. Convention, AMERICAN FOUNDRYMAN publishes some of the papers scheduled for presentation as examples of the type of material planned by the divisions and committees of the Society . . . to give certain papers maximum possible distribution . . . to put some papers received too late for preprinting separately into the hands of the readers prior to the Convention. This year "The Foundrymen's *Own* Magazine" printed the papers listed on this page. Separate preprints will not be available at Convention.

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Mechanics of Foundry Mechanization

And Improved Methods

R. J. ANDERSON / *Dir. of Mfg., Belle City Malleable Iron Co., and Racine Steel Castings Co., Racine, Wis.*

Reduced costs and improved quality can be obtained through mechanization and through better work methods, according to the author. Neither step alone will develop maximum savings; improved work methods are especially desirable in the smaller shop where size of capital investment limits extent of mechanization. Mechanization calls for a good preventive maintenance program to minimize down time.

■ Reasons for mechanization of a foundry are: (1) To reduce labor cost; (2) To reduce material cost; (3) To increase capacity with the available floor space; (4) To improve quality of product.

To reduce labor costs; we mechanize so that fewer men are required for handling the same tonnage, or so that more tonnage can be produced with the same number of men, or both. How this and the other advantages of mechanization were achieved are illustrated by scenes in the author's company.

With the old air furnace fired by pulverized coal, two truck drivers delivered coal to the various pulverizers and one crane operator and crane loaded the coal from the ground to the bunkers so that the shop trucks could be readily filled. Now the pulverizers have an outside coal hopper and coal is purchased locally. The coal company dumps the coal in the hopper and from there it is conveyed to a storage bin directly over the pulverizer. There is no labor connected with the handling of coal at the present time.

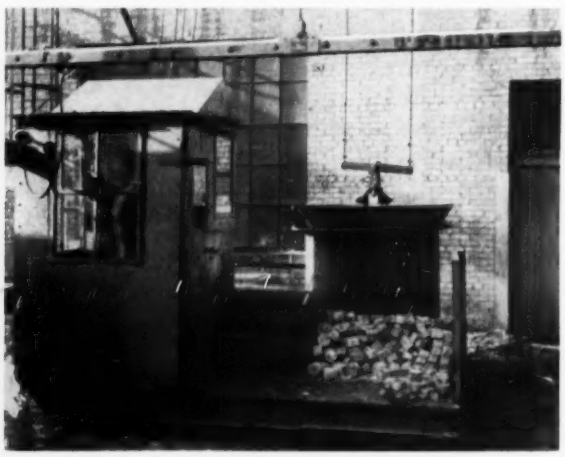
The overhead or yard crane used in making up the cupola charge requires only one crane operator who has a scale for weighing the charge directly in front of his cab. One charge car operator is also needed. These two operators are capable of charging 17 to 20 tons per hour, which results in a 25 to 30 per cent reduction in labor cost, plus the advantage of a continuous supply of molten iron. The cupola iron is run into the air furnace where analysis and temperature are adjusted.

For iron delivery, lift or fork trucks are used. These have a cylindrical ladle of 1000 lb capacity. The savings in both man hours and fatigue accomplished by this type of pouring, as compared to the old method, are obvious.

Molders formerly would put up the number of molds they thought they could pour off. Thus, molding pro-

Preprint No. 53-15. This paper will be presented at a Malleable Session of the 57th Annual Meeting, American Foundrymen's Society, at Chicago, May 4-8, 1953.

Yard crane used for making up cupola charge handles pig, purchased scrap, and returns easily and accurately.



Charge car, operated by one man, teams up with yard crane to handle 20 tons of melting stock and fuel per hour.

Charging bucket in one of Belle City's cupolas. Mechanization of charging reduced labor cost over 25%.

duction was pretty much controlled by the molders' ability to carry iron. In molding with the old side floor arrangement, a good molder would put up an average of 15 to 20 molds per hour. On Belle City Malleable's 12-hopper, squeezer molding line with power driven mold conveyor unit, production is from 30 to 50 molds per hour per man depending, of course, on the type of job and number of cores to be set. For this line one serviceman and one sweeper are required.

The jacket and weight shifting on this line is not good and a program to improve it will be discussed later. Pouring on this line is done with 1000-lb ladles and three men pour all the molds.

Slingers are used for heavy cope and drag molding. Production on this line is from 80 to 100 molds per hour depending on the type of job being run. Fatigue is very low on this unit because hydraulic slingers are used and there is no manual lifting anywhere on the line.

Weight Shifting Simplified

All of these molds are made in slip or pop-off flasks and all of the machines are the pin-push-off type. The drag is rolled over in a bail without the use of any bottom boards which, of course, eliminates clamping and facilitates dumping as compared to tight flasks. The bottom board is transite and is actually the car top, never leaving the car. The largest pop-off flask used is 27 x 52 in. because this is the largest size the conveyor car will take. The jackets and weights of these molds are shifted by two men. This is accomplished by timing so that the same type of mold passes a predetermined place on two parts of the loop. The jacket and weight are merely transferred from one mold to another with a hoist. Extended pins on the weights rest on top of the jacket when it is transferred so that both the jacket and weight are moved with one lift. Two men do all the pouring on the slinger line.

One man attends the automatic shakeouts. He supplies empty buckets from the overhead conveyor line and hooks the full buckets back on to be transported from the foundry to the hard iron spruing and chipping conveyor. Formerly, a number of men were used for dumping or shakeout.

Add Pallet Line

In mechanization it is important to make a careful study of the type of mold or castings that have to be made, giving consideration to such factors as availability of continuous iron and storage space, and the cooling time needed. After installation of the squeezer line as previously shown, and the slinger line, something had to be added to balance production requirements. A pallet line was added.

The flexibility of this 22-station unit, permits use of various types of metal, and both squeezer work and cope and drag work. Some metals are not delivered continuously but in batches from electric furnaces. Except for the flexibility of this unit, this would not be possible.

Considerable storage space, both before and after pouring, is provided for the molders. Each has from one to three hours storage space depending on the type of job and the length of floor. After the molds are poured and sufficiently cooled, they are dumped by a powered dump cradle. The sand and castings in this position are dumped to a conveyor which feeds them to the vibrating shakeout. The dump cradle, operated by a hydraulic motor, is then reversed. The car with the bottom board is returned to the molder by gravity on a return track underneath the platform. The author's company holds patents on this arrangement.

The company's sand mixing unit employs a timing device for elimination of manual labor and human element so that the best possible control and uniformity of sand mixes can be obtained.

Core Room Improved

Before mechanization, the company used conventional bench core making. Installation of two horizontal ovens with overhead conveyor resulted in substan-

Iron, with composition and temperature adjusted in air furnace, is delivered to pouring area by lift truck.

12-hopper squeezer molding line with power driven mold conveyor gives 30 to 50 molds per hour, depending on the nature of the casting and the number of cores to be set.

tial savings in core making and core trimming. However, equivalent savings could be had by applying the proper mechanics to the mechanization and equipment itself. For example, a study of the operation of one of the core blowers showed that the core machines were used only 25 to 30 per cent of the time. On that basis, to produce the equivalent of 100 per cent of the capacity of the core blowing machine would require at least two more machines or 200 per cent more capital investment.

The type of box and the method of handling boxes and equipment are just as important, if not more important, to savings then the conveyor and oven itself. After a study of this job, machine blowing time was increased approximately 100 per cent.

Castings loaded at the foundry shakeout are subsequently dumped on an apron conveyor for spruing and chipping prior to annealing. The sprue is left on the apron conveyor and as the buckets pass the chippers and spruers, it is picked off the apron conveyor and thrown back in the buckets. These buckets, on their travel back to the foundry, pass the charging yard at the cupola and the sprue is automatically dumped at this location.

These examples of mechanization give some idea of the possible savings from the actual mechanization of a few departments. Most of these savings are based on the melting, core, and molding departments and result from installation of the equipment. In addition, production per square foot of floor area is greatly increased, sand control is better and the quality of the castings is improved.

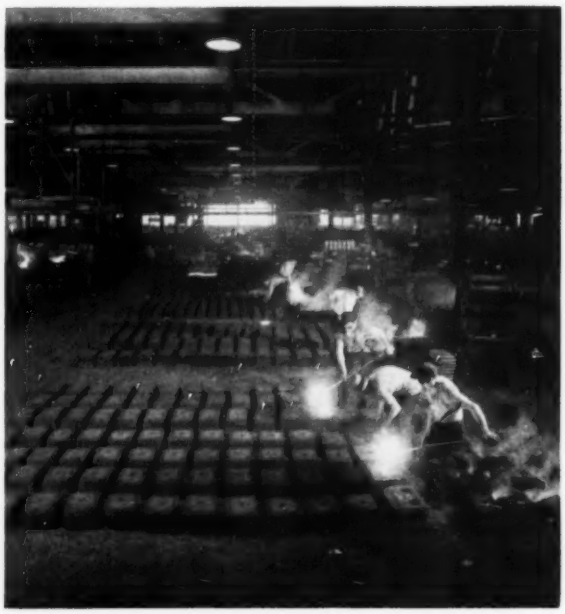
Reduce Material Costs Too

In connection with the reduction of material costs, a great deal has been and a lot more can be accomplished. For example, sand reclamation is a source of savings, not only on the basis of the actual sand saved but by the elimination of handling cost of both bringing sand in and removing sand. Resin and other new binders should furnish a real incentive for greater study to develop a sand for both cores and molds that will result in lower costs and improved quality. Mechanical sand mixing has greatly improved sand quality and resulted in improved quality of castings. This, in turn, reduces finishing costs.

One of the points that should be emphasized is that in any substantial mechanization it is found that an operation is not one but anywhere from 5 to 25, or 50 smaller operations. These various units generally are not given careful enough study; insufficient importance is attached to them in studying the original layout. The result is an efficient unit except for one or two items of work. Too little attention is paid to the small items that really make the investment worth while.

Avoid High Capital Investment

The smaller foundry cannot afford to spend one or two million dollars to install molding and handling equipment, but must still sell in a competitive



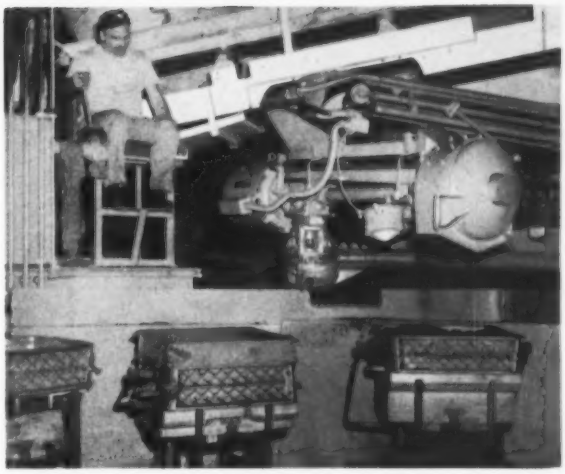
market. To do this, cost of operations cannot be out of line, so savings and methods of cost reduction must be applied without high capital investment. This can be illustrated by improvements made in the author's plant. As an example, experience shows that a substantial reduction in grinding costs can be accomplished by using pressure fixtures, or special fixtures for long runs. The cost of these fixtures is small and the results are very gratifying; in fact a 20 to 30 per cent savings is not unusual. This is true whether or not the plant is mechanized. And savings can amount to 10 to 40 per cent on operations and even on total department costs.

Follow-Through Important

In the case of a plant that is mechanized, the importance of following through with the type of improved methods suggested cannot be over emphasized for large or small plants. Savings gained can almost equal savings accomplished originally through mechanization. A good mechanic or mechanical engineer with ingenuity and initiative, with cooperation of foremen and top management, can accomplish these savings.

Savings of this type made on individual jobs, operations, or piece of equipment are usually permanent and not affected by the operations of other equipment. For example, on the squeezer line there are many pieces of equipment, including the elevators, conveyors, shakeout, sand mill, and all the electrical equipment and automatic equipment that goes with it. There are 12 molders on this line, and all it takes to stop 12 molders from working, plus the shifters, pourers, shakeout man, and spruers and chippers, would be one switch going out, one elevator belt breaking, or any one of a number of small items failing will stop that type of equipment.

Besides the possible mechanical failures that cause downtime, other considerations are material handling, material delivery, and service to the mechanized lines; such as, cores, sand, metal delivery, pattern changes, pattern and flask repairs, etc. Each contributes anywhere from ½ to 3 or 4 per cent downtime during a shift, and by the end of a shift, totals 10 to 15 per cent.



Hydraulic slinger operated by man at left produces 80 to 100 molds per hour, is used for heavy cope and drag work.

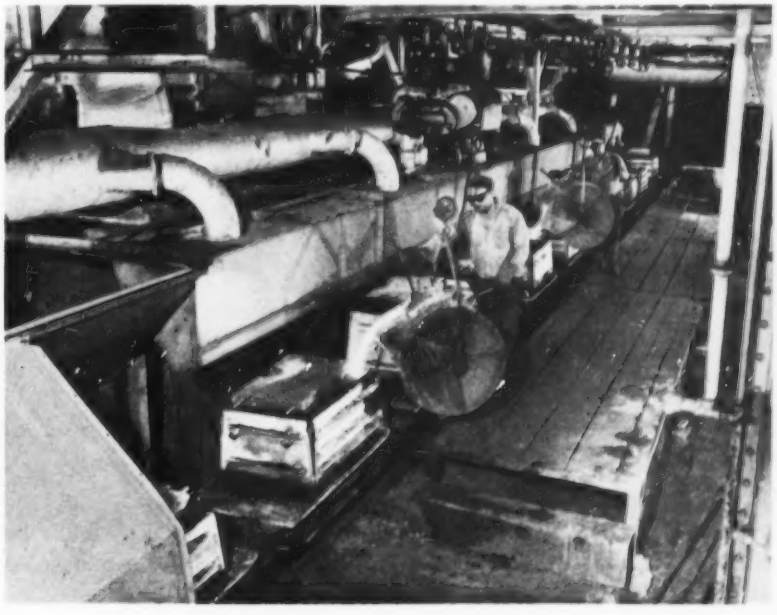
Don't Underestimate Downtime

In laying out a mechanization job, one would originally figure the capacity for sand and pouring and the possible production per molder per hour. On that basis, reduction in costs expected to be realized from the capital investment involved would be estimated. Without careful study, one would figure about five per cent downtime, but it is probably closer to the 15 per cent mentioned previously. The result is another 5 or 10 per cent unanticipated downtime, which in turn is loss of tonnage or production. This tonnage or production based on, for example, 1,000 tons of castings per month would be a loss of 100 to 150 tons of castings. At today's selling prices this is a substantial amount of money.

Besides that, after budgeting man-hours for the

Before (left)—Pouring off in the old foundry before mechanization.

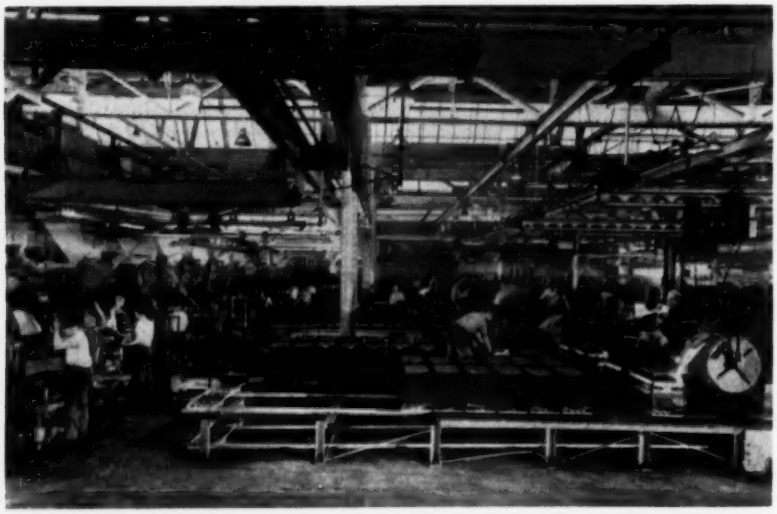
After (right)—Pouring of squeezer molds as well as the slinger molds shown being poured here is mechanized for maximum efficiency and minimum fatigue of pouring crew.



balance of the departments on the basis of forecasted tonnage, a plant finds itself with enough men to finish 1,000 tons of castings but winds up with 850 to 900 tons. This again increases costs in subsequent departments. It is easy to see how costs of mechanization—costs not originally considered—can run up. Thus, every mechanized unit in the plant is in effect part of another unit and any difficulty on mechanized lines anywhere will have an effect on the balance of the operations. This points up the importance of better than usual scheduling of materials to the mechanized lines and also emphasizes the great need for and the importance of a good program of preventive maintenance. These are increasingly important, the more mechanized a plant is. Considering the problem of maintenance alone, it is known that a better maintenance department will produce substantial savings, in increased tonnage due to less downtime, in replaced parts costs, and in total operating costs.

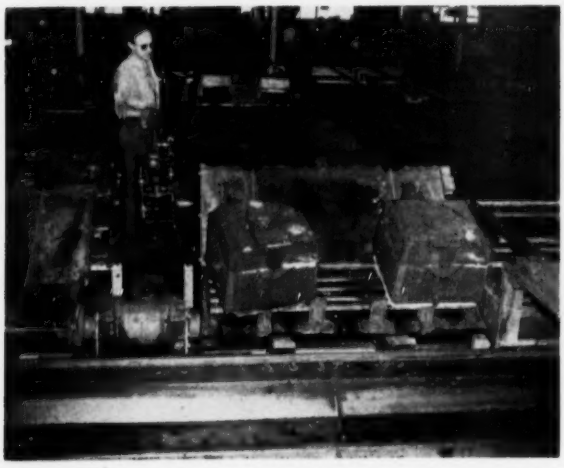
Two Approaches to Maintenance

There are two approaches to the maintenance problem. One is to have a so-called repair department pro-



Above—Molds slide onto shakeout grate automatically as conveyor car is tilted mechanically.

Left—22-station pallet line rounds out molding facilities and provides flexibility not available through squeezer and slinger units.



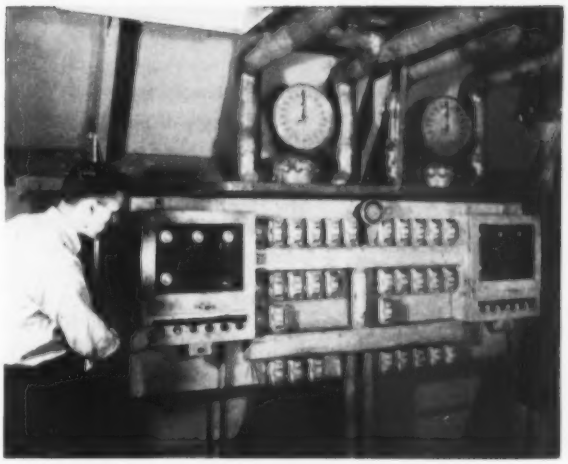
Power dump cradle empties pallets onto conveyor which carries castings and sand to vibrating shakeout.

Automatic dump cradle in return position. Pallet with bottom boards returns to molder on under-floor track.

vide breakdown maintenance. The other is to have a maintenance department which will provide maintenance service to prevent breakdowns—in other words, a preventive maintenance program. Such a program can be carefully planned as to labor and material requirements and would consist of:

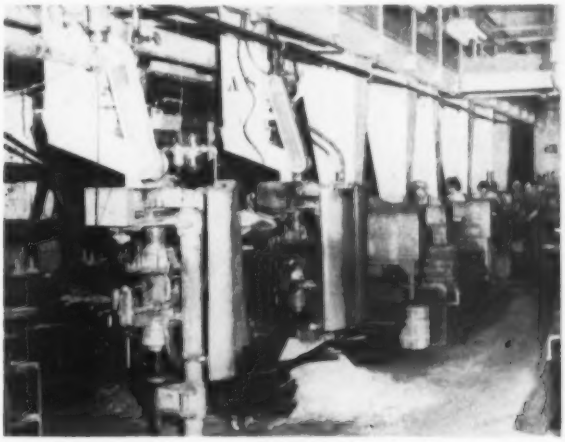
1. Inspection by a competent inspector.
2. Daily maintenance-work schedules based on the inspector's findings. (Work Order System.)
3. Creation and operation of an equipment log.
4. Program of regular replacements of expendable material.
5. Study of each equipment failure with a view to determining the cause of the failure and then taking the necessary steps to correct it.
6. Instructions to operating personnel.

Some interesting results of ratings to determine the effective use of labor indicated that it was only 65 per cent. The primary cause of loss was a managerial problem rather than poor effort on the part of the workmen. The largest single loss factor was inaccurate and insufficient information on work orders. This shows the importance of *improving work orders* and developing more effective planning and scheduling. This is a continuing project.



Controls for two muller-type sand mixers automatically eliminate manual labor and human element of sand control.

View in old core room before modernization shows production of cores by hand; baking was done in batch ovens.



Same core room as at left following installation of two horizontal, conveyorized ovens and core blowers.

The foundry industry is following essentially the pattern established in the automotive industry and industries supplying it. A study of the progress made in the automotive industry shows that originally the savings and increased production were the results of conveyor lines that moved a car from one work station to another. That, in effect, is the same procedure followed in the foundry.

The reduction in the cost of cars did not result from the reduction in labor and materials alone. The automotive people made their greatest savings by: (1) having suppliers mechanize their plants, (2) standardization and interchangeability of parts, and (3) competent industrial engineering and methods departments, which took one job at a time, made a thorough study of it, and reduced the number of operations and improved efficiency. In their machine shop, new machine tools were designed and built that gave a 100 to 500 per cent increase in production on one part. Research to develop new materials was also responsible for a great deal of reduction in costs.

The foundry industry is going through the same phases of production and cost reduction that the automotive industry went through some years ago. For that reason, savings possible in the casting industry through reduction in costs on individual jobs and operations are still very substantial.

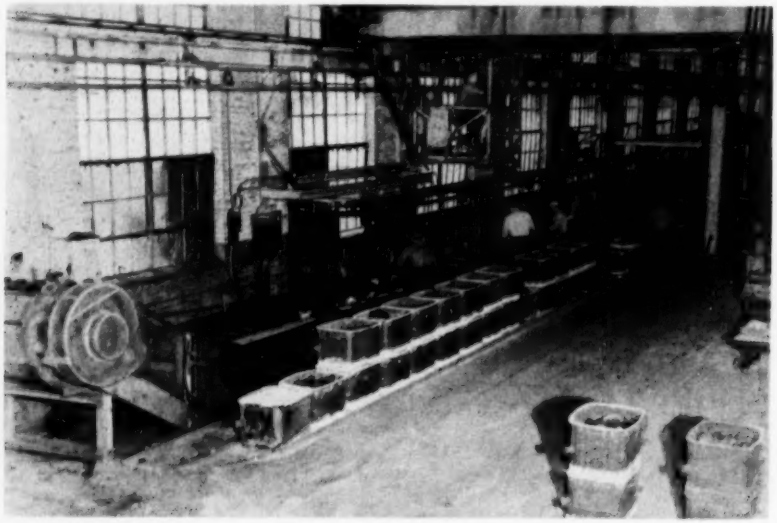
Where Do We Stand?

Has the foundry industry progressed or kept in step with other industries? Sand molding was started about 650 B.C., and the first molding machines were used in about 1890! The beginning of foundry mechanization came only about 60 years ago. Look again at the automotive industry. In about 1915 that industry started working on production methods and has made extensive progress in 30 to 40 years. They didn't make that progress by just putting in conveyors for assembly lines; they made a complete study of the problem.

The automotive people then called in material supply engineers to determine what material best fitted

that particular job. They called in machine tool builders and other tool and die engineers to determine what machine tools to use, how many operations could be eliminated, how many could be combined, and with each step or change they insisted on better quality and close tolerances. While tolerances of plus or minus 0.003 to 0.005 in. were considered close, now 0.0002 to 0.0005 in. are not uncommon in production.

The automobile manufacturers called in the engineers from the steel mills. They explained their problem and they developed a good deep drawing steel so the entire turret of the body could be drawn in one piece eliminating all of the fitting, welding, soldering, etc., that had to be done with the old material. The result again was a much better product at lower cost.



Buckets back of chipping and spruing conveyor carry sprue to charging yard and automatically dump near cupola.

The tire companies are another example of an industry that has developed and progressed to keep pace with the great progress in design, methods of manufacturing, and development of new materials.

The foundry industry should take note of the advances that have been made in forging and stamping techniques . . . fabrication and weldments of many parts that were previously castings . . . parts made of powdered metal, and with the hydrogen brazing methods. These units generally are cheaper in cost than castings and usually reduce machining costs because the part is held to much closer dimensional tolerances.

Foundry Must Compete

These things seem to point up the importance of the foundry industry finding materials and methods that will, at a competitive cost, maintain a finish and dimensional tolerance on castings which will give competition to the materials mentioned.

Some work has been on shell molding and pressure molding, but there is much to be done in order to produce at a cost that will be competitive. In addition, if the industry applied enough good mechanical study and research to result in 15 to 20 per cent of cost being labor, instead of 50 per cent as it is now, both the individuals and the industry as a whole would benefit.

The field of material handling alone is one that has potential savings beyond the comprehension of most foundrymen. Sand reclamation is significant because it saves on the initial cost of the sand, the excessive handling cost, for unloading and storing cost, and cost of hauling away refuse sand. Coke handling (for the foundries that use coke) is another phase of material handling which if properly done would eliminate the cost of handling and greatly improve melting by the elimination of fines. The foundryman buys good coke, then proceeds to break up about 10 per cent of it by using clam shell buckets or some other means of unloading that causes the coke to be broken.

Mechanics Determine Success

In conclusion, it should be remembered that it's the mechanics of each individual job that determines whether or not mechanization is successful. To overlook them is to literally step over dollars to pick up nickels.

One phase of production badly in need of this kind of study is molding materials—such as resin binders and equipment for handling it—that will produce a casting at a lower cost than the present sand casting, and hold dimensional tolerances to a fraction of what is done now. Another is improved methods of cleaning castings. Present cleaning does not do a satisfactory job. Tests indicate that after pickling, which removes all sand and scale, tool life was increased 50 to 150 per cent. Improved methods for removal of metal such as gates, riser connections, fins, etc., for the reduction of finishing costs, is in order.

A serious study of pattern and core box equipment should be made to eliminate fins, parting lines, etc., to reduce finishing costs, and to develop composite molding practice wherever possible to reduce molding costs and increase yield. By using time and motion study, work simplification, quality control methods, research, and good preventive maintenance, the industry can greatly improve its costs and its products.

Finally the industry can obtain graduate engineers from the universities through the FEF program. These engineers have taken studies to specifically fit them for the foundry industry; they can be the answer to many foundry problems.

Arc Furnace Developed for Casting Titanium

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An electric arc furnace has been developed at Frankford Arsenal for making castings of titanium which weigh about 1½ lb. Melting and casting are carried out in an enclosed water-cooled, gas-tight copper box to prevent contamination. Heat is introduced directly into the metal by a direct current arc maintained between a water-cooled, tungsten-tipped electrode as the cathode and the bath as the anode. The charge consists of a 12½ lb slug of titanium. The heat introduced by the arc melts a pool of metal weighing about three lb. The unmelted titanium "skull" serves as a crucible to hold the molten metal. The skull must be of the same alloy composition as that desired in the bath.

An inert atmosphere of purified argon stabilizes the arc and protects the hot titanium from atmospheric contamination. The casting is formed by pouring into a mold of machined graphite.

■ The Army Ordnance Corps in recent years has been vitally interested in developing titanium alloys so they may be substituted for the more common metals in ordnance applications. This interest is encouraged because titanium is relatively abundant in the United States, being the fourth most prevalent structural element after aluminum, iron and magnesium. Furthermore, many titanium alloys are light, strong, ductile, corrosion resistant and have good mechanical properties over the temperature range between—75F and 800F (—60C and 427C).

Titanium products are now available from several commercial producers in this country, but these products are entirely in the wrought form and are limited to plate, sheet, forgings, and a small amount of tubing and wire. No commercial source of titanium castings is known although there is some work directed toward development of casting techniques[1]. The problems of casting titanium are particularly difficult because titanium has a high melting point and is extremely reactive in the molten condition. Although the casting of titanium is a complex process it may have economic justification because of the difficulties in machining titanium, and titanium alloy parts from wrought bars.

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Frankford Arsenal Arc Furnace

Figure 1 is a cross-sectional view of the arc furnace used to melt and cast titanium alloys at Frankford Arsenal. The essential features of the furnace include the gas-tight water-cooled copper crucible and cover, the water-cooled tungsten-tipped electrode which has a 22 degree bend at its melting end, the electrically insulated electrode guide bushing in the cover, the inert argon atmosphere, the mold chamber, the graphite mold, the water-cooled copper mold-door and the trunnions for tilting the entire assembly. Figure 2 shows the furnace (with all the parts identified) open

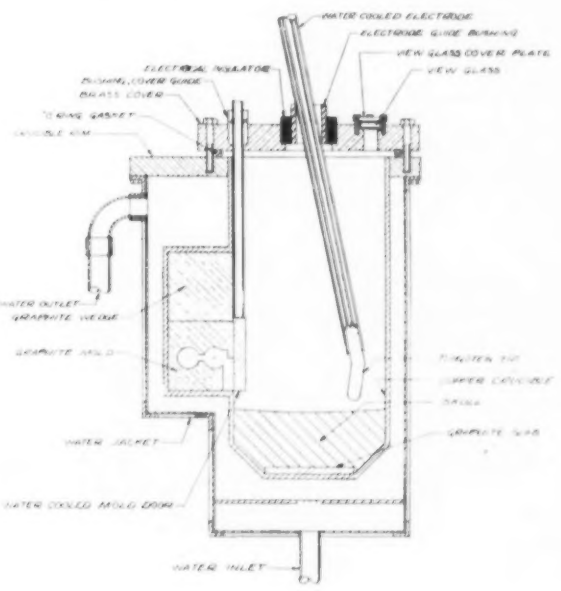


Fig. 1—Diagram of the tilting arc-casting furnace assembly for melting and casting titanium.

for loading; and Fig. 3 tipped forward for pouring.

Two sight glasses for observation of the melting operation are mounted in the brass furnace cover which is tightly sealed to the crucible rim by means of a rectangular O-ring. The moveable water-cooled electrode passes through a water-cooled stainless guide bushing which is sealed into, but electrically insulated from the cover by a micarta ring. Sleeves of gas mask tubing, not shown in the drawing, provide flexible seals for the electrode and the mold door. Heat is furnished by a direct-current arc maintained between the negatively charged electrode and the titanium skull acting as the anode. Power for the arc is provided by two 600-ampere direct-current welding generators connected in parallel.

The mold is made up of graphite sections which are machined to shape and incorporate adequate draft so that they may be readily stripped from the casting after use without damage to the mold (Fig. 4A).

Operation of Furnace

Arc Melting Atmosphere. The cover is bolted onto the crucible so that the O-rings make a gas-tight seal. The retractable water-cooled door is adjusted so that it covers the mold as shown in Fig. 5A. The melting chamber and its charge are evacuated to a pressure of about one centimeter of mercury, absolute, by means of a mechanical pump, filled with argon (99.96+ per cent pure), and re-evacuated and refilled two more times. During this final refilling operation the argon atmosphere is adjusted to a positive pressure of about two to three centimeters of mercury. The argon serves the dual purpose of providing an inert atmosphere to protect the molten titanium and of permitting the formation of a stable, easily controlled arc.

Fig. 2—Tilting arc-casting furnace opened for loading reveals the water-cooled mold door and tungsten-tipped electrode. Note extensive water cooling required.

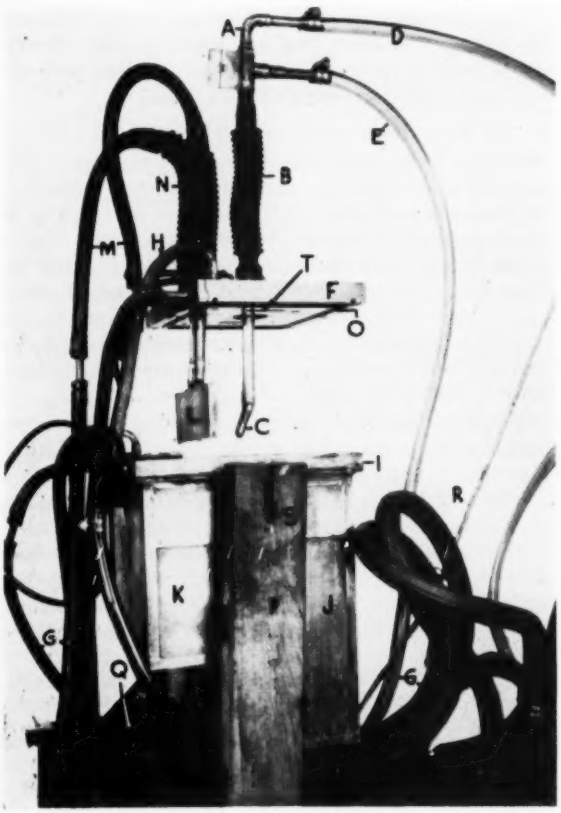
A. Electrode and terminal lug
B. Electrode flexible sleeve
C. Electrode tungsten tip
D. Electrode water inlet
E. Electrode water outlet
F. Furnace cover
G. Water hoses
H. Argon outlet and evacuating port
I. Crucible rim
J. Water jacket
K. Mold Chamber
L. Water-cooled copper mold-door
M. Water hose to door
N. Door flexible sleeve
O. "O" ring gasket
P. Furnace trunnion support
Q. Supporting block
R. Hose counterbalance rope
S. Furnace trunnion
T. Sight port

Preparation of Pigs. A titanium casting must be homogeneous and uniform in composition to be of maximum utility. The arc melting process is not conducive to making a uniform alloy from directly charged components, because only a small portion of the charge is molten at one time. Thus, it is necessary to provide melting stock which contains the desired alloy additions in uniform distribution. This is accomplished by making preliminary pigs which have the desired alloy content evenly distributed throughout. Each pig weighs about 2½ lb and is made in the following manner:

Melt Titanium Sponge

Approximately 0.6 lb of four to eight mesh Dupont process "A" titanium sponge is placed on the bottom of the crucible. No graphite insert is used during the preparation of pigs. Additional sponge of coarser size is charged over this bed until the furnace contains about 2½ lb of material. When it is desired, alloying elements can be added. These additions are made to the charge before closing the furnace. For carbon alloys, the desired amount of carbon is introduced as 40 to 60 mesh high purity carbon powder or CS grade graphite powder.

The amount of this powder required for the desired alloy is sprinkled on top of the sponge and during subsequent melting is thoroughly mixed into the titanium by means of the electric arc. When other alloying agents are to be used, they are mixed with the coarse titanium sponge. A few pieces of coarse titanium sponge are placed on this mixture so that the arc may



be struck against the sponge surface without contacting the alloy addition.

The furnace is sealed and flushed with argon as previously described. The generators are set at 90 volts, open-circuit, and 200 amperes. The arc is struck and the electrode withdrawn to produce an arc of 23 to 26 volts. As soon as a molten pool has formed the current is raised to about 600 to 700 amperes. This current is used to consolidate the alloy and the sponge into a shallow pig of the desired gross composition. After consolidation, the generators are shut off and the pig is allowed to cool for a half-hour before it is removed from the furnace. No special effort is made to insure complete solution of the alloy in the pig as this is accomplished during subsequent melting in the skull. Briquetting under pressure would accomplish essentially the same purpose as pigging if a suitable press and dies were available.

Melt Solid Block

Preparation of the Skull. Titanium alloy castings of the desired composition and free from contamination are made in this furnace by using a block of solid titanium alloy as the charge. The electric arc is directed against the top of the block to bring this portion to the desired temperature. Characteristically, in this process only the top layer of the charge is molten. Because this molten metal is actually part of the solid container it is necessary that the skull as well as the bath should have the same alloy composition as that desired in the final casting.

The block comprising the charge is made from five of the pigs described in the preceding section. These pigs are stacked on a ¼ in. thick slab of graphite on the bottom of the copper crucible as shown in Fig. 5A. The furnace is sealed, evacuated, and flushed with argon as previously described. The pigs are then consolidated by remelting with the arc into a skull weighing about 12½ lb. This requires about ten minutes at 600 to 700 amperes and 26 volts during which time the electrode is moved over the stacked pigs to effectively melt them into a single block.

No effort is made to completely re-melt all of the pigs so that numerous voids are left around the sides of the skull. These convoluted voids do not impair the skull in any way and actually may improve its efficiency

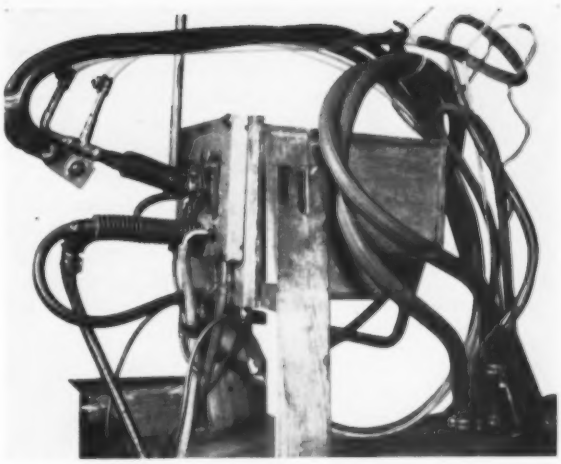


Fig. 3—Illustrating arc-casting furnace assembled and tipped forward as in pouring the casting.

as thermal insulation. The graphite slab remains as an integral part of the skull in subsequent operations (Fig. 5 and 6). Since the metal at the bottom of the skull does not become molten and the diffusion of carbon in titanium is extremely slow at the temperature of the graphite-skull interface, no carbon pick-up is realized. A separate skull of the correct composition must be provided for each alloy composition desired in the cast product.

Mold Baked Out

Preparation of the Mold. A high density, CS grade graphite is used for making the mold. The mold is made in sections machined to shape and incorporating adequate draft so that they may be readily stripped from the casting after use without damage. Prior to being used the first time for making a casting, the sections are packed in graphite powder for protection from the atmosphere and baked out for about an hour at 1200F. The baking operation removes residual hydrocarbons and occluded gases to preclude their evolution at the time of pouring which would contaminate the hot metal.

Whenever a new mold is used without the baking pretreatment a dark blue stain is formed on the sur-

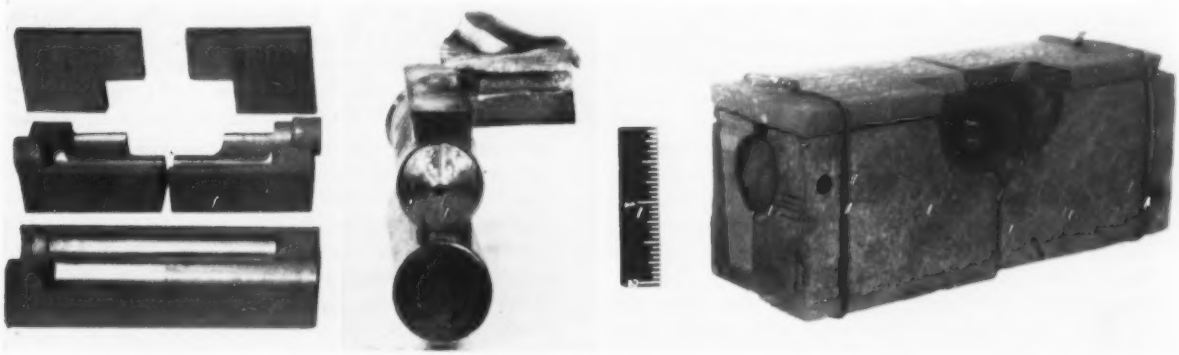
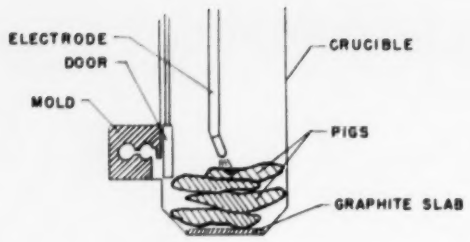
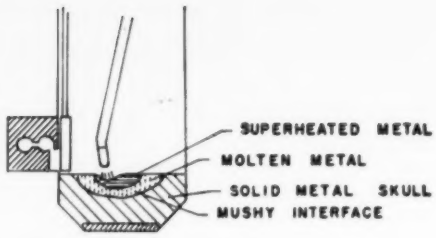


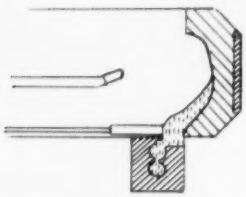
Fig. 4a (left)—Sections of the machined graphite mold ready for assembly. Fig. 4b (center)—A titanium casting after removal from the mold. Fig. 4c (right)—Graphite mold assembled and held together with soft iron wire ready for use. The wear from 15 previous heats is clearly evident in the spalled corners of the mold sections.



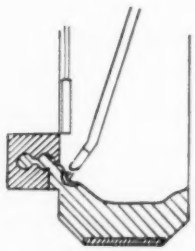
A. CONSOLIDATION OF PIGS TO FORM SKULL. (DOOR IN LOWERED POSITION.)



B. SKULL FORMED — MOLTEN POOL PRODUCED



C. CASTING POURED (DOOR RAISED TO POURING POSITION.)



D. SKULL SURFACE LEVELED — SPRUE BEING CUT OFF (DOOR COMPLETELY RAISED.)

Fig. 5—The four major steps in the production cycle of the tilting arc-casting furnace.

face of the casting and the skull during the casting operation. Obviously, this stain is a layer of metal contaminated by the gases given off by the mold during casting, because the metal is always bright and uncontaminated when the mold has been properly prebaked or previously used for casting.

To make a casting the sections of the mold are assembled and held together with soft iron wire (Fig. 4A and 4C). The assembled mold is placed in the mold cavity and secured in position with graphite wedges preparatory to being filled. The water-cooled copper mold door is adjusted so that it covers the mold to protect it from spatter and radiant heat until it is ready to be filled (Fig. 5A and 5B).

Door Protects Mold

Making a Casting. To make a casting in this furnace a skull of the desired composition is prepared from suitable pigs as just described. The mold door is closed to protect the mold from radiant heat and metallic spatter during melting.

After consolidation of the pigs, the heating is continued to form a molten pool large enough to make a casting. The electrode tip is moved slowly about in a 4-in. diameter circle over the center of the skull for about five to eight minutes (Fig. 5B). This operation at 600 to 700 amperes and 26 volts thoroughly preheats the skull and the preheating time is adjusted according to the fluidity of the alloy being melted. The current is then raised to approximately 1200 amperes. The voltage which in arc melting is directly related to the arc gap is maintained at about 23 to 26 volts. The increased current causes a deeper penetration of the arc into the molten bath so that an adequate quantity of properly superheated metal may be provided for the subsequent casting operation.

A considerable excess of molten metal in the bath is required over that needed to fill the mold. This excess provides for the spine attaching the skull to the casting (Fig. 5C), for any overflow around the sprue of the casting, and for the chilling that occurs when the arc is shut off prior to pouring.

High Current Will Suffice

When sufficient superheated metal has been obtained, usually about five minutes at the high current will suffice, the mold door is raised just enough to clear the mold entrance as shown in Fig. 5C; the supporting block, Item Q in Fig. 2, is removed; the current is turned off; and the metal is poured by tilting the entire furnace assembly on its trunnions (Fig. 3 and 5C). The final sequence of operations is done as rapidly as possible to minimize cooling of the metal and to eliminate any splatter entering the mold once the door is raised. Less than two seconds elapse between the raising of the door and the completion of the pour.

Cut Spine With Arc

This process produces a casting which is still secured to the parent skull by a metal spine (Fig. 5C and 6). The spine must be severed before the casting and the mold may be removed from the furnace. To accomplish this, the furnace is allowed to cool for six minutes in the pour position and is then returned to the upright position for cut-off. The arc is restruck using 90 volts open-circuit and 200 amperes. The current is raised to 350 amperes and the electrode spacing is adjusted to about 26 volts. The arc is first played on the surface of the skull to smooth out the edges, and then it is directed around the sides to melt down the metal accumulated there. This operation is usually completed in about six mintues depending upon the amount of excess metal and its position in the crucible. When most of the excess metal has been remelted into the skull, the arc current is reduced to about 250 amperes and the arc is used to sever the spine connecting

the skull with the casting (Fig. 5D). Figure 7 shows that the depression in the skull has been essentially filled in during the consolidation operation accompanying cut-off.

The cutting operation is facilitated by constructing the electrode with an inclined tip, (Fig. 1), so that the low-current arc may be directed against the actual metal to be removed. This final cutting operation requires less than two minutes for completion. A minimum of three hours is allowed for the skull and casting to cool before the furnace is opened to avoid atmospheric contamination of the skull.

Another casting can then be made using the same skull as the source of metal. In this case, however, since the starting material is a consolidated and cold skull, preheating time must be allowed. A casting can be poured about 15 to 20 minutes after striking the arc. During the last five minutes of this period the current is raised to about 1200 amperes in order to effect sufficient penetration of the heat into the bath to provide the required amount of superheated metal. The cavity in the skull of Fig. 6 is about 1⅜-in. deep which was the penetration obtained in making the attached 1½ lb casting.

Production Takes Time

After two castings are made from each skull, a 2½-lb pig of identical composition is added to replace the metal that has been cast. The present operating procedure requires two days to produce six pigs for a new skull of each alloy, and after that from one to two castings can be made each day.

Figure 4 shows a typical titanium casting and a graphite mold. The shrinkage during solidification is confined to the upper section of the modified keel-block casting so that test bars are machined only from the bottom bar. Between ten and 15 castings can be made in a mold before it must be replaced due to excessive spalling of the graphite. The shape of this test bar casting was selected because it is relatively easy to machine the graphite into this configuration.

Figure 8 is a cast titanium link which weighs about ½ lb. The slot and the holes were formed about solid graphite cores secured in the graphite mold. On the small end of the link is an embossed letter M formed in an impression in the mold. This casting was made to illustrate the good definition possible in casting titanium. This "commercially pure" titanium casting has a Brinell hardness of 156.

Design Considerations

The most important phase of the casting problem is the development of a suitable method for melting titanium. This method must provide molten metal in sufficient quantity to fill the molds in one continuous pouring of short duration and the metal must be uniform in composition and free from any contamination. These requirements pose many special problems, because molten titanium will react with oxygen and nitrogen of the air and will attack all known structural materials and refractories which are at the temperature of the bath[2]. Furthermore, the products of these reactions in the molten metal and even when present only in traces will seriously embrittle it for subsequent use.

Graphite is the only known refractory which has consistently shown any resistance to attack when containing molten titanium, but even then the amount of carbon dissolved exceeds 0.30 per cent and is so inconsistent it cannot be predicted in successive heats[3]. As little as 0.15 per cent carbon limits the amount of most other alloying elements which may be introduced without lowering the ductility and seriously impairing the weldability of titanium. No heat treatment has been reported which will notably alleviate these deficiencies.

Fig. 6—A titanium alloy casting attached to its parent skull by a metal spine formed from excess metal during pouring. Spine is normally severed with the arc before removal from the furnace. The cavity is 1⅜ in. deep and the skull is 6 in. by 7 in. by 2⅜ in. thick.

Induction melting presents a compact method of melting under a protective inert atmosphere and the rapid stirring caused by the electrical field insures uniform composition. However, no suitable crucible material other than graphite is available for use with titanium, so that this method is inadvisable where the inherent carbon pick-up is likely to be detrimental to the application of the product.

Avoid Metal Contamination

Arc melting provides a method for introducing the heat directly into the bath without contamination from the container or surroundings[4,5]. The arc is maintained between an electrode and the molten metal contained in an inert crucible which is water-cooled to prevent reaction with the molten titanium. Contamination by the air is prevented by melting in a vacuum or an inert atmosphere of argon or helium.

Either an alternating current or a direct current arc may be used for melting, but each type of power has its own characteristics which adapt it for special applications. For example, when the direct current arc is used the positive anode receives almost twice the amount of heat that is received by the negative cathode. Obviously, when alternating current is used each electrode then is alternately anode and cathode. Thus, it is advisable to use the direct current arc for melting with an inert electrode, whereas either direct current or alternating

current may be used for the consumable electrode.

The consumable electrode is very efficient with the high melting point metals such as molybdenum[5], but an inert electrode is normally used for melting titanium except in special applications. The thermal emission efficiency of the arc increases rapidly as the electrode temperature is increased[7]. Titanium melts at a temperature below this optimum emissivity so that when made of titanium, the electrode melts off very rapidly without introducing sufficient heat into the bath to meet it completely.

Prefer Inert Electrodes

Inert electrodes are usually provided with water cooling and are tipped with graphite or tungsten to enable them to withstand the extremely high temperature of the electric arc. Furthermore, they are used with direct current and the electrode is connected as the cathode and the bath as the anode to benefit from the large difference in heat distribution between these two polarities.

The problem of producing titanium castings is further complicated by the need for a mold material which not only will resist attack by the molten titanium flowing into it, but will also be practical for the production of castings. For instance, conventional sand molds suitable for use with steel have been utterly unsatisfactory for titanium because of the rapid reaction with the silica. Bonded refractories, shell molds, and investment molds are made by techniques which might be developed satisfactorily for use with titanium, but permanent molds of graphite were deemed the most practical for immediate use.

The final requirement in satisfactorily making castings is only slightly less important than those preceding. This is the means by which the molten metal is transferred into the mold from the bath. Bottom pouring and centrifuging methods are possible, but lip-pouring by tilting the complete apparatus was considered to be the simplest for casting titanium.

Conclusions

As now developed, the tilting arc furnace is a useful tool for the laboratory production of small castings of titanium alloys for test purposes. This furnace is particularly suited to the production of small castings up to 1½ lb in weight without contamination from the atmosphere, crucible material, or mold material.

The principle of skull melting should be applicable to the production of larger castings, but probably

Fig. 7—The cavity in the skull of Fig. 6 has been filled in during the consolidation operation accompanying cut-off of the spine. Cut-off is final step in furnace.

Fig. 8—A titanium link cast in the tilting arc-casting furnace. The mold and cores were made from solid graphite. This casting weighs about ½ lb, has a hardness of 156 Bhn.

would require a relatively cumbersome apparatus. Several advantages should accrue through the use of a larger furnace. For example:

1. A larger furnace should be much more efficient because a proportionately smaller skull may be used than is required for the 1½ lb casting. The surface to volume ratio of the skull in the large furnace is less, so that heat losses through the bottom and by radiation from the surface would be less.

2. The larger furnace should facilitate the use of more flexible molding techniques such as the shell type of plastic bonded refractory sands if they prove to be practicable for titanium. Thus much more complicated shapes may be cast than are economically possible with the machined graphite molds.

3. A larger furnace could be used to cast several small units at one time from a single runner.

Acknowledgements

The authors wish to express their appreciation to Harold Markus, director of metallurgical laboratory, and to Lt. Col. Daniel J. Murphy, former chief, Pitman-Dunn Laboratories, for providing the opportunity and assistance required in carrying out this development.

Bibliography

1. W. L. Finlay, R. F. Malone, and P. F. Darby, "Castings by Skull Melting," *Iron Age*, vol. 170, no. 16, Oct. 16, 1952, pp. 111-113.

2. E. J. Chapin, "Evaluation of Refractories for Melting Titanium," *Symposium on Casting of Titanium at Frankford Arsenal*, April 30, 1952.

3. E. I. Larsen, E. F. Swazy, L. S. Busch, and R. H. Freyer, "Fabricacion of Titanium-Rich Alloys," *Industrial and Engineering Chemistry*, vol. 42, no. 2, Feb. 1950, pp. 237-242.

4. O. W. Simmons, C. T. Greenidge, and L. W. Eastwood, "Production and Arc-Melting of Titanium," Office of Naval Research *Report on Titanium Symposium*, March 1949, pp. 77-91.

5. S. F. Radtke, R. M. Scriver, and J. A. Snyder, "Arc Melting of Titanium Metal," *Trans.*, A.I.M.E., vol. 191, pp. 620-624; *Journal of Metals*, vol. III, no. 8, August 1951.

6. R. M. Parke, and J. L. Ham, "The Melting of Molybdenum in the Vacuum Arc," A.I.M.E. *Metals Technology* TP No. 2052, vol. 13, no. 6, September 1946.

7. Compton, *Journal* A.I.E.E., vol. 46, 1927, pp. 1192.

Effect of Sand Flowability on Casting Surface Finish

H. H. Fairfield / *Chf. Met., William Kennedy & Sons, Owen Sound, Ont.*
James McConachie / *Sand Supv., William Kennedy & Sons.*

This paper reports results of some experiments made in an effort to measure flowability of molding and core sands and to relate flowability test values to surface finish. This is the third report on casting finish submitted by the writers to A.F.S.

■ During an investigation of grain size of sand and its effect upon casting finish[6], the data shown in Table I was obtained. Four different sands would produce castings of identical smoothness. However to get equivalent smoothness, one sand had to be jolted 32 times, another sand needed only 8 jolts. It was apparent that these sands differed in their resistance to compacting. This would seem to be a very important property of molding and core sands. In practical foundry operations, surface finish is more dependent upon flowability than on the grain size of the sand.

The mechanics of sand flowability have been studied by several investigators[1,2,3,4,5]. Up to the present time however, the American Foundrymen's Society has not adopted a sand flowability test. A quantitative test for sand flowability would help sand control technicians in developing mixtures that could be rammed to a smooth finish with the least amount of work. Experi-

Preprint No. 53-23. This paper will be presented at a Sand Division Session of the 57th Annual Meeting, American Foundrymen's Society, at Chicago, May 4-8, 1953.

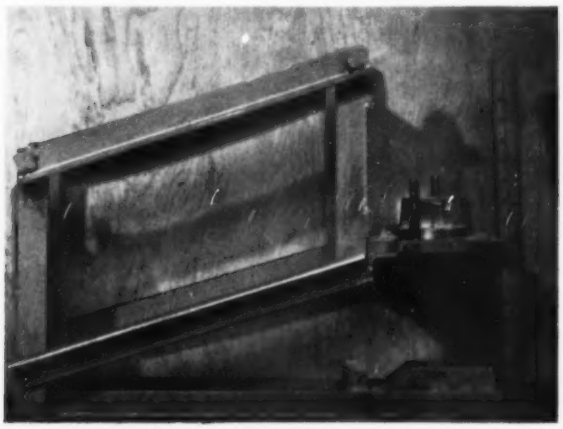


Fig. 1—Laboratory machine for measuring flowability.

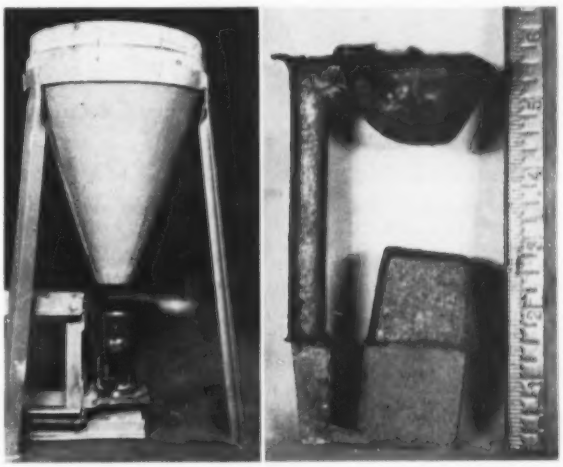


Fig. 2—At left, flowability machine set up for filling flask with sand. At right, test casting.

Fig. 3—Needle tipped dial indicator tests smoothness.

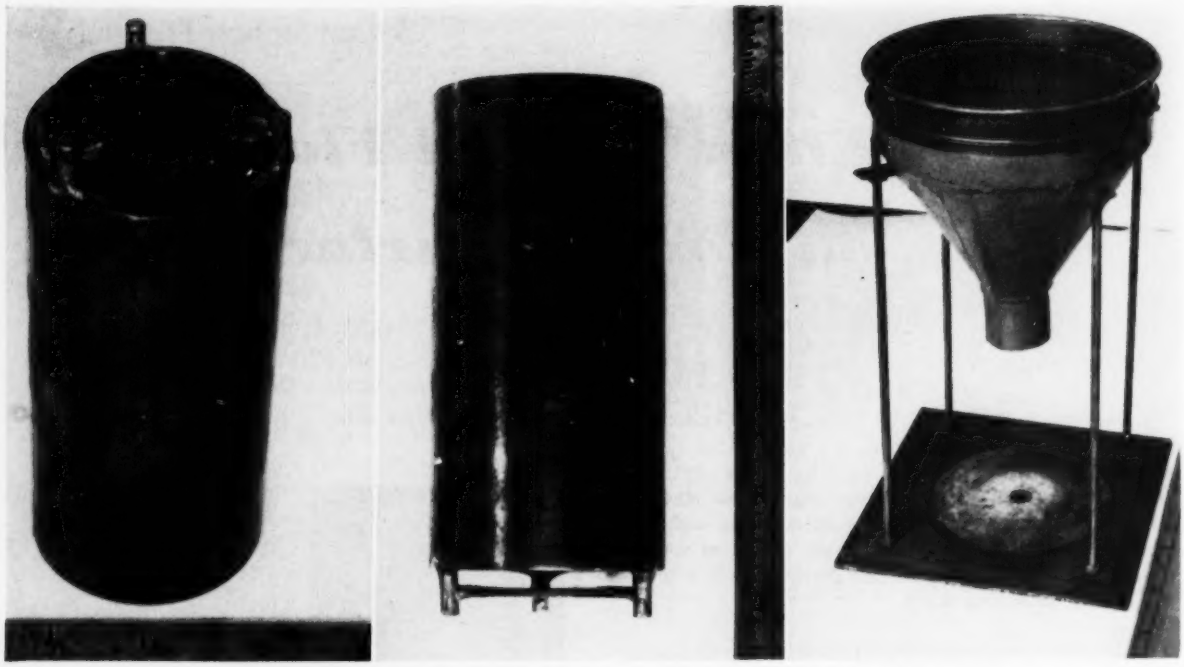


Fig. 4—Kennedy flowability tube (left and center) and hopper used to fill tube in making flowability measurement.

ments made to try and determine the value of three flowability test devices are described in this report.

Figure 1 shows the hand operated jolt machine with a mounted steel pattern. The test casting is 1½ in. square and ⅝ in. thick. Figure 2 shows the flask and flask extension in place under the filling hopper and a test casting. To measure surface finish, a needle tipped dial indicator (Fig. 3) is used. This method was proposed by Hobman[7].

Three instruments were used in an attempt to measure the flowability of sands. These are the Dietert, the Kennedy, and the Ramability Test. In the Dietert test, a standard 2-in. sample of sand is rammed in a specimen tube. A fourth ram is given the sand, then a dial indicator is placed to measure the length of the sand specimen. The sand is then given a fifth ram. The reduction in length of the specimen is recorded in thousandths of an inch. If the specimen is shortened 0.015 inches the flowability is reported as 85 per cent (100-15).

Disc Fastened to Ramming Tube

The Kennedy flowability test is shown in Fig. (4). A 2-in. diameter disc is fastened to a standard ramming tube by means of three pins so that a 3/16-in. space is left for the escape of sand. To make the test, the specimen tube is loaded by rubbing the sand through a 6-mesh riddle into a hopper. The sand is struck off level and the specimen tube is placed under the A.F.S. sand rammer. The rammer plunger-raising device is adjusted until the ramming head is just inside the end of the specimen tube, then the lever is released. A pan placed under the specimen tube catches the sand pushed through the orifices at the bottom of the specimen tube by the free fall of the rammer. The weight of

TABLE 1—MOLDING EFFORT VS. CASTING SMOOTHNESS[6]

Sand Mix	Number of Jolts Required to Get Optimum Casting smoothness	Dietert Flowability Number
5	8	82
2	16	83
1	24	83
6	32	80

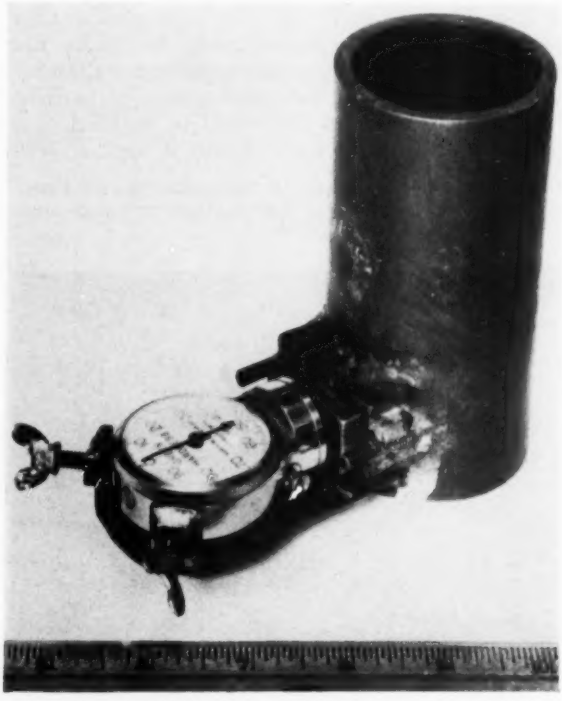


Fig. 5—Ramability tube and indicator as assembled.

Fig. 6—Three components of ramability test equipment. Part of side wall (left) of tube moves as sand flows.

this extruded sand is a measure of the flowability of the sand.

The Ramability test device is shown in Fig. 5 and 6. Note that a section of the side wall of the standard specimen tube has been made movable. This movable piece is ¾ x 1⅜ in. and ¾ in. long. As the weight is carefully lowered by hand, displacement of sand is indicated on a mold hardness tester.

Table 2 gives the sand mixtures used and their properties. Seven of the experimental mixtures were made with a 100-mesh silica sand. With the exception of the rotten wood powder, all materials were commercial grades in common use. Table 3 shows the grain size of the sands used.

Experimental Procedure

In mixing, 10 kilogram batches of sand were run in a laboratory sand muller for 1 minute dry and 3 minutes wet. In preparing the core mixtures, the oil was added last. Tests were on a single batch of sand.

Sand was rubbed through a ⅛-in. riddle and allowed to fall into the flask as shown in Fig. 2. The sand was compacted by raising the mold 1½ in. and dropping it against a steel block. The number of jolts given each mold is shown in Table 2. The test casting was made in the drag. Copes were rammed up in core sand and baked. All molds were poured at 2100 F with 85-three-5's bronze.

Gates and risers were cut off in a bandsaw and each test surface was cleaned with 20 strokes of a wire brush. All surface readings were taken on the vertical surface of the casting at the center of the 1½ x 1½ in. sides. The surface finish is reported as the standard deviation of 25 readings.

With the exception of the three different flowability tests described previously, all of the other tests were standard A.F.S. tests.

Discussion of Results

All of the test data obtained are shown in Table 2. Molding sand mixtures 1, 2, and 3 contain 3.8, 7.4, and 10.7 per cent clay, respectively. Figure 7 shows the effect of clay content upon the surface finish obtained with these sands. It is apparent that with increasing clay content the flowability of the sand is reduced and a rougher surfaced casting is obtained. In this set of experiments, the Dietert flowability test and the Kennedy flowability test are correlated with casting finish results.

Core sand mixtures 5, 6, and 7 have green compression strengths of 1.6, 3.5, and 5.7 psi. Surface finish readings on castings made in these sands are shown in Fig. 8. Mixture 5 required only 4 jolts to get a smooth finish. Mixture 7 required 8 jolts, and mixture 6 re-

TABLE 2—SAND MIXTURES AND TEST RESULTS FOR SURFACE FINISH EXPERIMENTS

Sand Mix	Clay Bonded			Oil Bonded			Synth.	Nat.
	1	2	3	5	6	7		
No. 111 Sand, grams*	10,000	10,000	10,000	10,000	10,000	10,000	9,500	
South. Bentonite	400	800	1,200		200	350		
Core Oil				150	300	400		
Cereal Flour				50	50	150	50	
Iron Oxide							50	
Rotten Wood Pwdr.							30	
Silica Flour							500	
Moisture, %	5.4	5.3	5.0	4.4	5.4	5.0	5.2	8.0
Green Comp., psi	4.0	7.3	16.0	1.6	3.55	5.7	3.1	8.3
Permeability	38	37	37	39	27	24	35	9.5
Green Def., in./in.	0.025	0.031	0.027	0.021	0.025	0.028	0.025	0.019
Density, lb/cu ft	93	91.7	89	93½	94.5	95	94	105.5
Dry Permeability				50		43		
Dry Comp. Str., psi				60		1350		
Mold Hardness								
4 jolts	19	12		12	15	11		
8 jolts	24	20	20	17	21	19	23	35
16 jolts	38		31	20	33	30	33	43
24 jolts	44	30	35	30	36	36	43	
32 jolts	50	40	37					56
48 jolts			42				50	
Ramability, In.	0.027	0.0365	0.0312	0.019	0.023	0.016	0.0256	0.018
Dietert Flowability	85	78.8	70	89	85	82	82	75
Kennedy Flowability	1.65	0.97	0.55	3.1	2.0	2.4	2.0	2.8
Surface Finish**								
4 jolts				0.9	4.4	1.6		
8 jolts	3.9	10	14	0.7	3.9	0.8	2.4	1.9
16 jolts	2.0	3.2	7.3	0.82	0.9	1.15	2.4	2.3
24 jolts	1.4	4.0	6.2	0.98	1.1	1.29	1.4	1.2
32 jolts	1.1	2.5	6.8				2.2	2.0
48 jolts			5.8				2.2	

*All weights in grams.

**Surface finish in 0.001 in. units standard deviation.

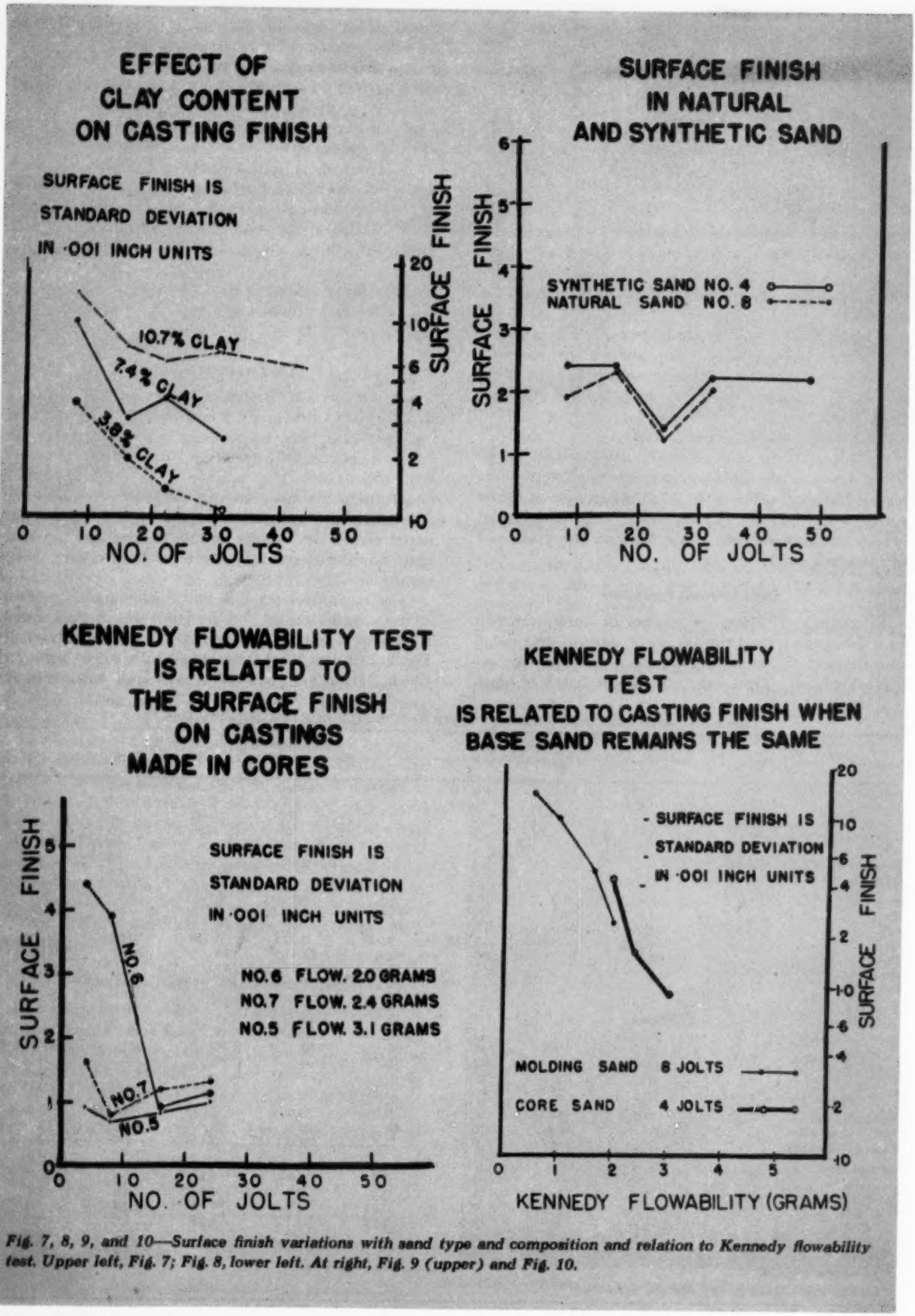


Fig. 7, 8, 9, and 10—Surface finish variations with sand type and composition and relation to Kennedy flowability test. Upper left, Fig. 7; Fig. 8, lower left. At right, Fig. 9 (upper) and Fig. 10.

quired 16 jolts. Note that the Kennedy flowability test is directly related to the number of jolts required.

As Fig. 9 shows, the high flowability of the natural sand tested was almost duplicated in the synthetic

TABLE 3—SCREEN ANALYSES OF TEST SANDS

Size	Per Cent Retained	
	No. 100 Silica	Natural
10 Mesh	0.1	0.2
20 "	0.3	0.4
30 "	0.4	0.6
40 "	0.5	3.8
50 "	0.7	4.6
70 "	3.5	9.0
100 "	26.7	12.4
140 "	40.7	9.8
200 "	22.3	10.8
270 "	3.3	10.4
Pan	0.9	21.6
Clay	0.6	16.4

sand. However the green compression strength of the synthetic sand was reduced to 3.1 psi. to get the desired flowability. It would be helpful to know how to duplicate the high flowability of natural sands and at the same time obtain high green compression strength.

Test Swelling Tendency

Many of the castings were oversize or swelled. These castings were measured for thickness at the center of the 1½ x 1½-in. surface. These measurements, shown in Table 4, indicate that the tendency of the mold to swell and produce an oversize casting appears to be related to the ramability test.

Within the scope of this investigation, it seems possible to obtain a quantitative measure of flowability. Figure 10 indicates the correlation of Kennedy flowability test values with surface finish. Since surface finish of castings depends to a great extent upon the flowability of molding sands and cores, a quantitative test for flowability would be of great help to sand control technicians.

Practical Value of Kennedy Test

In the 1952 Progress Report of the A.F.S. Flowability Committee, a visual test for flowability is recommended. J. B. Caine suggested that the Kennedy flowability test be compared to the committee's test. For this comparison four sand mixtures were prepared,

TABLE 4—CASTING THICKNESS AND SAND RAMABILITY

Sand Mix	Thickness, In.	Ramability, In. Displacement
3	1.13	0.0315
2	1.06	0.0365
1	0.744	0.027
4	0.668	0.026
8	0.626	0.018

Pattern size, 0.622 in. In all cases mold was jolted 8 times.

and the results after running are shown in Fig. 11.

Sand specimens were rammed by slowly lowering rammer until full weight rested on sand. After one minute specimen was removed from tube. The Kennedy flowability test result is shown. Note that amount and size of surface supervoids are related to the Kennedy flowability test result. The sand which had a flowability of 3.2 grams contains no visible supervoids. The specimen of sand which had a flowability of 0.5 grams has many supervoids in the surface.

It would appear therefore that the two testing methods are measuring the same property of sands—the tendency to form supervoids on the rammed surface.

A description of the four sands shown in Fig. 11 is given in Table 5. Conclusions drawn from these tests are given on page 132.

TABLE 5—COMPARISON OF FLOWABILITY RESULTS

Sand Mix	Mixture	Mixing Procedure	H_2O %	Flowability Kennedy, Grams	Flowability A.F.S. Rating
1	10,000 grams No. 100 silica sand with 400 grams southern bentonite.	Dry 1 min., wet 3 min. in lab muller. Dried out, retempered, rubbed through sieve 3 times.	5.4	3.2	9 Trace of supervoids in corner away from rammer.
2	10,000 grams No. 100 silica sand with 800 grams southern bentonite.	Same as above.	5.4	1.9	7 Small supervoids in bottom third of specimen.
3	Same as above but 1,200 grams southern bentonite.	Same as above.	5.0	0.8	5 Larger supervoids in at least half of specimen.
9	10,000 lb No. 57 silica sand, 5% western bentonite, 1% corn starch.	Dry 1 min., wet 3 min., in foundry muller. Pass through aerator.	4.8	0.5	3 Large supervoids in about all of specimen.

For method of determining A.F.S. flowability rating see Report of A.F.S. Flowability Committee, Preprint 53-24.

Fig. 11—Flowability test specimens showing relation between Kennedy flow value and number of supervoids.

Within the limits of this investigation the following conclusions can be drawn:

1. Casting finish depends in part upon the ability of sand to flow under ramming.

2. The Kennedy flowability test was shown to be related to casting finish on 8 different sand mixtures.

3. The A.F.S. Flowability Committee test procedure was shown to correlate with the Kennedy flowability test procedure on 4 different sand mixtures.

Acknowledgement

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Bibliography

1. H. W. Dietert and F. Valtier, "Flowability of Molding Sand," A.F.S. *Transactions*, vol. 42, pp. 199-206 (1934).

2. P. E. Kyle, "Flowability of Molding Sands," A.F.S. *Transactions*, vol. 48, pp. 175-189 (1940).

3. E. O. Lissell and E. J. Ash, "A Study of the Flowability of Foundry Sands," A.F.S. *Transactions*, vol. 50, pp. 637-656 (1942).

4. W. H. Moore, "Flowability of Molding Sands," A.F.S. *Transactions*, vol. 58, pp. 650-660 (1950).

5. R. E. Grim and W. D. Johns, Jr., "Compaction Studies of Molding Sands," A.F.S. *Transactions*, vol. 59, pp. 291-295 (1951).

6. H. H. Fairfield and J. McConachie, "Effect of Sand Grain Distribution on Casting Finish," A.F.S. *Transactions* vol. 59, pp. 523-528 (1951).

7. A. Hobman, "How to Measure Surface Roughness of Castings," AMERICAN FOUNDRYMAN, Oct. 1949, p. 46.

▶ *Calendar of future meetings and exhibits*

April

20-22. . 1953 Metal Powder Show
Hotel Cleveland, Cleveland. Ninth Annual Meeting.

24. . Malleable Founders' Society
Drake Hotel, Chicago. Western sectional meeting.

25-May 10. . Liege International Fair
Liege, Belgium.

May

1. . American Association of Spectrographers
Chicago. Symposium.

4-8. . A.F.S. 57th Annual Convention
Chicago. Five-day, non-exhibit convention.

6-8. . American Society of Training Directors
Sheraton Plaza Hotel, Boston. Annual Conference.

15. . Malleable Founders' Society
Hotel Commodore, New York. Eastern sectional meeting.

18-22. . Material Handling Institute
Convention Hall, Philadelphia. 5th national materials handling exposition.

20-22. . Society for Experimental Stress Analysis
Hotel Schroeder, Milwaukee. Spring Meeting.

22. . Malleable Founders' Society
Drake Hotel, Chicago. Western sectional meeting.

June

8-10. . Malleable Founders' Society
Homestead, Hot Springs, Va. Annual meeting.

15-19. . Int'l. Materials Exposition
Grand Central Palace, New York. Exposition of basic materials for industry.

29-July 3. . American Society for Testing Materials
Chalfonte-Haddon Hall, Atlantic City, N. J. Annual Meeting.

July

24. . Malleable Founders' Society
Drake Hotel, Chicago. Western sectional meeting.

September

17-18. . National Foundry Association
Plaza Hotel, New York. Annual meeting.

19-26. . International Foundry Congress
Paris, France. Host: Association Technique de Fonderie de France.

21-22. . Steel Founders' Society
Homestead, Hot Springs, Va. Fall meeting.

24-25. . Ohio Regional Foundry Conference
Netherlands Plaza, Cincinnati. Sponsored by A.F.S. Cincinnati, Northeastern Ohio, Central Ohio, Canton, and Toledo Chapters.

October

8-9. . Michigan Regional Conference
Michigan State College, East Lansing, Mich. Sponsored by A.F.S. Central Michigan, Western Michigan, Detroit and Saginaw Valley Chapters and Michigan State and University of Michigan Student Chapters.

8-9. . Gray Iron Founders' Society
New Hotel Jefferson, St. Louis. Annual meeting.

15-17. . Foundry Equipment Manufacturers' Association
Greenbrier, White Sulphur Springs, W. Va. Annual meeting.

19-23. . 35th Nat'l Metal Exposition & Congress
Cleveland Public Auditorium, Cleveland.

November

4-6. . Steel Founders' Society
T & O Conference.

March, 1954

15-19. . Nat'l Assn. Corrosion Engineers
Kansas City Municipal Auditorium, Kansas City. 1954 Conference & Exhibition.

May, 1954

5-7. . American Society of Training Directors
Schroeder Hotel, Milwaukee. Annual conference.

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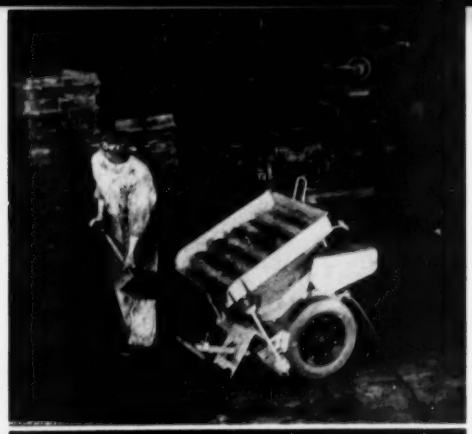

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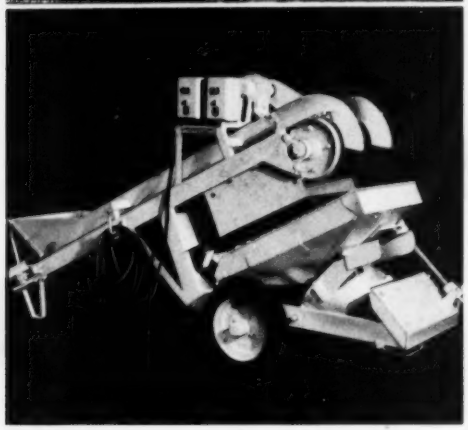

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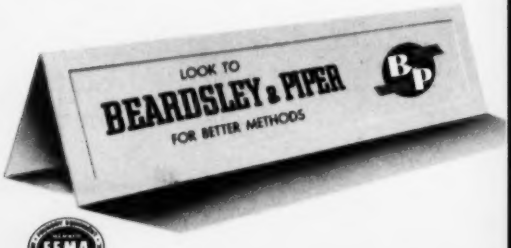

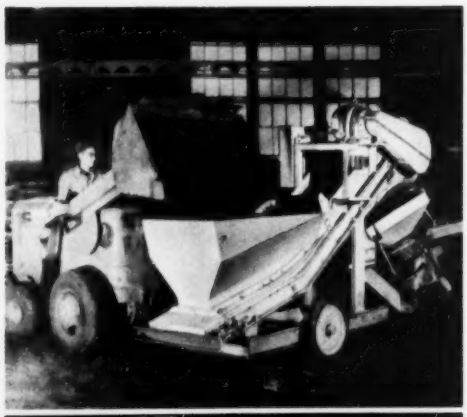

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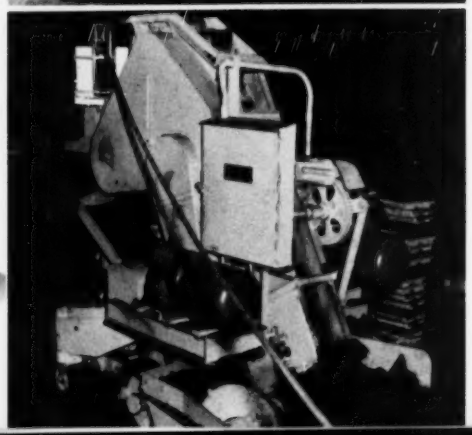

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Mystery of Shell Molding Patterns Explained

RAY OLSON / *Production Pattern & Foundry Co., Chicopee, Mass.*

■ What's so mysterious about shell molding patterns? From the remarks occasionally heard, there must be a feeling of mystery concerning them. It is likely that this feeling is fostered by little or no knowledge of the action that takes place, both chemically and physically, in the making of a shell mold. When there is a rough understanding of this action, many of the pattern requirements are apparent, clearing away most of the mystery.

A possible definition of a shell molding pattern is, one or more patterns located on one or two pattern plates. This equipment is constructed of a material which will stand repeated heating to a maximum of about 600 F. Pattern or patterns to be arranged on plates so that both halves, or cope and drag, match with locators established on the plate surface. The locators are usually of a male and female type, set into and projecting above the plate surface, so as to create a corresponding condition on the joint face of the two halves of a shell mold. Provision is usually made in the plate area around the pattern for the installation of ejector pins, which push the shell from the pattern after curing.

We could elaborate on this definition. Reference could be made to special requirements of shell core boxes. However, the general specifications above are the basic needs for producing most shell molds.

Patterns used in this process usually consist of two fundamental types; those made of aluminum and those made of cast iron. Aluminum stands more or less alone as a material which can be processed at reasonable cost to produce a shell molding pattern which is suitable for experimental and medium production usage. With some care and attention, aluminum patterns and plates will produce 5,000 or more shells before they need replacing. Very good results have been obtained with the use of aluminum plates ½ in. thick, producing 15 in. by 20 in. shells. Aluminum plaster cast plates are particularly adapted to irregular partings at the joint of the two shell mold halves.

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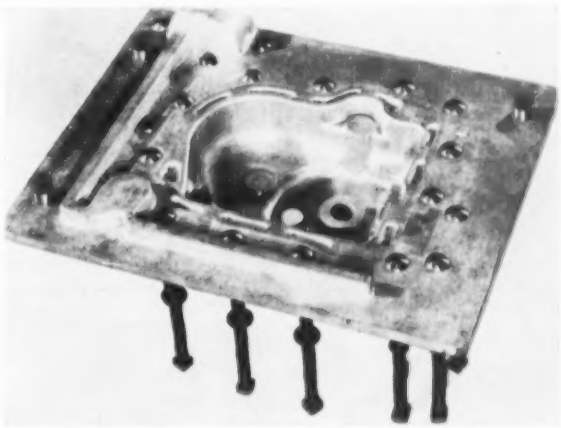
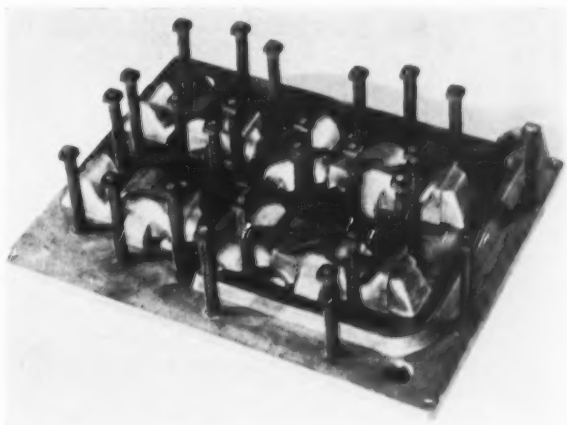
It is also profitable in some cases to replace aluminum shell patterns as many as three times, and still not exceed the cost of initial cast iron equipment. This is particularly true if master patterns and pressure cast aluminum plates are used.

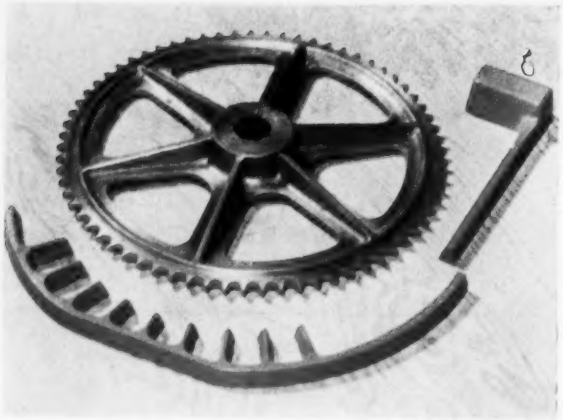
In many cases, master patterns are made of aluminum completely machined and carefully finished for



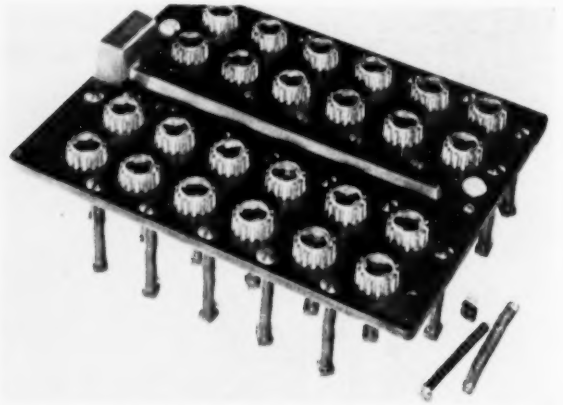
Aluminum pattern produces good, low cost shell molds.



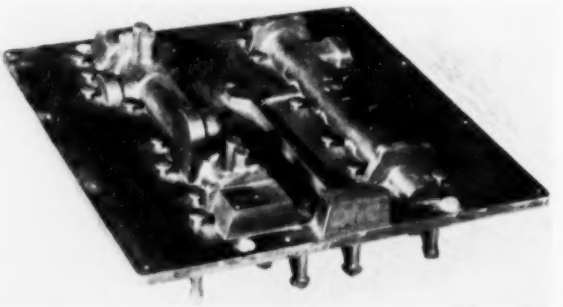
Plaster casting permits close matching of partings.



Aluminum master pattern has accurately machined teeth to correct shrinkage. Wood gating supplied with master, to be cast integrally with aluminum plate.



Intricate patterns can be duplicated by using an aluminum master pattern and shell casting brass or iron patterns.



Cast iron plate produces both halves of shell mold due to centerline parting.

use in pressure plate making. This permits working to closer tolerances and decreases the possibility of master damage in case of re-use.

Aluminum patterns can be machined and finished individually, and then secured to the pattern plate. Pattern dimensions can be accurately determined with this technique, and clean, sharp parting lines established. However, care must be exercised in fastening screws or bolts tightly, as repeated heating and cooling may tend to loosen them. This heat problem also promotes corrosion in the threads, causing the screws to break when they are removed. Coating the screws with high temperature lubricants retards this tendency. Patterns, plates and gating cast integrally eliminate these fastening problems.

In the cast iron class of shell patterns, two other materials are included: brass or bronze and steel patterns. These are included in the cast iron grouping, because first, the cost of producing patterns of either of these two metals is comparable to cast iron costs, and second, their usage is minor compared with cast iron.

Treatment for Cast Iron

Long wearing iron patterns that will take a high surface finish can be made on an analysis similar to: carbon, 3.10 per cent; silicon, 1.90; manganese, 0.80; sulphur, 0.10; phosphorous, 0.10. This iron can be annealed at 1,500 degrees for one hour, if improved machinability is required for thin sections. Stress-relieved flat iron plates, ground to ½ in. thickness, are used with excellent results.

Important savings can be made in the duplication of multiple impression iron, brass, or steel patterns. This is especially true if the shape of the patterns is somewhat complex, a type requiring a number of machining operations. First, if a wood master pattern is used, it is made with an additional metal shrinkage or extra machining allowance. From this is made an aluminum master pattern which is accurately machined and finished. This aluminum master is mounted on a small plate. This plate can be more or less standard and re-used indefinitely. From this plate-mounted master, small shells are made. These shells are then poured with the required pattern material. Usually, a small amount of finish is left on joint faces and extremely critical areas. The complicated surfaces of these shell cast patterns can be finished on the bench, eliminating much costly machining.

Fine finishing of vertical surfaces of any type metal shell pattern requires close attention. This should consist of strokes perpendicular to the parting line, being careful not to create backdraft.

Cause Pattern Damage

One of the hazards of the use of aluminum patterns is their susceptibility to nicks and bumps. One of the most common causes of nicking is carelessness in removing a sticking shell. Very often, the closest tool at hand is used by the operator to remove a sticker. This might be a screwdriver, which is a dangerous tool so far as aluminum patterns are concerned. Pointed hardwood sticks will do just as well; dowel stock is excellent.

Another common cause of pattern damage is improper pattern storage. Shell molding patterns should be stored on edge in a storage rack. This rack should include pegs or other suitable supports to hold the plates upright. By allowing a small space between patterns, the ejector pins of one plate will not gouge the adjacent pattern.

Shell molding is similar to other casting techniques from the draft allowance standpoint. This statement is made to counteract a general feeling that shell patterns require very little draft.

Patterns should be made with sufficient draft allow-

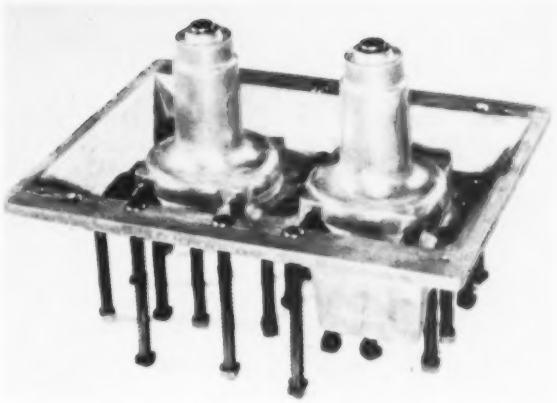
ance to permit uninterrupted shell mold production with a broad range of sand-resin mixes, a thin shell, or a variation in condition of cure.

The tighter the draft allowance, the more closely all of the above variables must be controlled. In some cases it has been impossible to place a sufficient number of ejector pins in a plate to insure obtaining a shell in one piece, because of draft limitations.

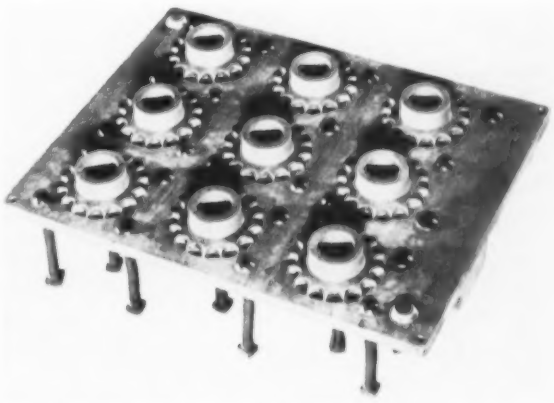
There is no standard angle that can be universally recommended for draft purposes. In contrast to green sand molding, holes or chambers in a pattern sometimes eject more readily than an exterior projection, such as the holes in a wheel, as compared with the hub outside diameter. There seems to be a slight shrinking action of the cured shell against these outside diameters or projections. Shells can be made in steady production, with little or no draft on a few points, if other vertical surfaces have some excess draft allowance. In general, an attempt should be made to obtain the same draft allowance as would be used in green sand molding. Draft angles can be reduced by dressing down the patterns. Adding draft presents more of a problem.

Ejector Pin Design Important Factor

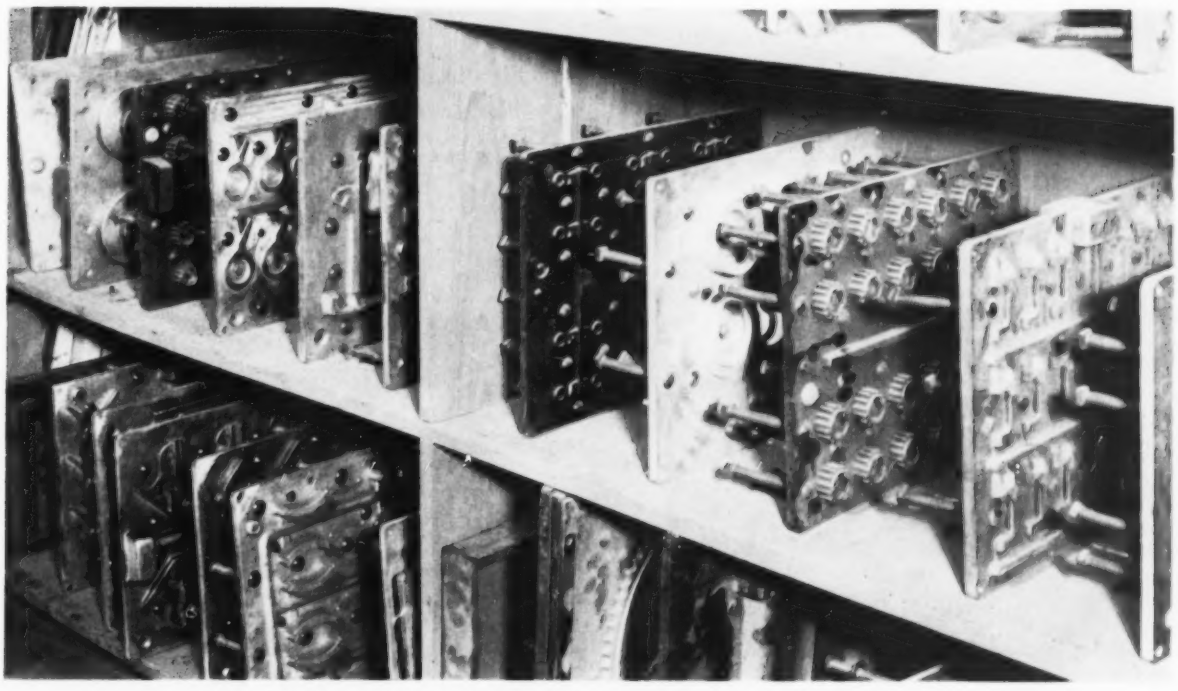
Ejector pin design and placement constitute one of the most important factors in the production of shell molds. Many of us have started in this process on the premise that the ejection assembly required a subplate, or ejector plate, fitted with guide posts lined up with holes through the underside of the pattern plate. The ejection pin holes, in turn, had to be line bored, or otherwise matched in both pattern plate and ejector plate. These holes in our first patterns were all fitted with very few thousandths of an inch clearance. First, this arrangement was very costly. In some instances,



Long vertical draws require careful finishing with strokes perpendicular to parting line.



Shells can be made with less draft in the bores.



Care should be taken to prevent pattern damage by using safe storage racks.

the cost of rigging a pattern with this ejection assembly equalled the cost of producing the patterns. Second, on many jobs it is necessary to relocate or add pins after tryout. This is, obviously, also expensive. Third, we found that the close fits required by this assembly were not suited to steady production; pins were sticking, due to the abrasive (galling) action of the fine grains of sand.

The simplest, cheapest design of ejector pins seems to be working most satisfactorily. This design requires no sub-plate. If trouble should occur, and a pin or spring becomes damaged, it can be replaced in a minute without removing the pattern from production. One type of pin which is coming into increased usage is a slight modification of a common carriage bolt. The section immediately under the head is dressed or turned down to the bolt diameter, to permit the head to set flush on the face of the pattern plate. Best practice is to drill, not ream, a hole through the plate, at least 1/64 in. to 1/32 in. larger than the bolt diameter. Comparatively light stainless steel springs work very well, retained by the carriage bolt nut. The nut doesn't tend to loosen or turn, because of slight spring pressure.

Carriage Bolts Good Ejectors

Cotter pins and washers are also commonly used to retain the springs. The crowned head of the carriage bolt does not harm the joint face of the shell as long as it is not on a casting surface. In fact, tests have shown that this oval section has definitely less shearing action on hot, just-cured, shells than the flat, flush ejector pins which were first used.

Another type of pin, similar in characteristics, is inexpensively produced of drill rod on a screw machine. The head consists of a separate steel disc, retained by a snap ring. The spring is retained by a split washer, commonly used as a bearing retainer. One good feature of this pin is the fact that the relationship between the underside of the head and the bottom of the pin can be held to a few thousandths of an inch in the screw machine. This causes uniform ejection when the ejector platen contacts the bottom of the pins. With carriage bolts, the ends of the pins must be sized, because of coarse manufacturer's tolerance.

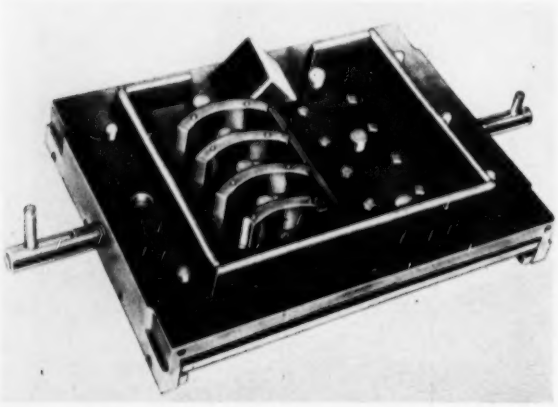
There are a number of techniques used to assemble and hold together the two halves of a shell mold for pouring. Some are poured with backup material, and others without. It is not the purpose of this article to discuss this phase of shell molding; however, regardless of the technique used, it is desirable to start with a reasonably flat joint surface. Some deviation from a flat, true surface is caused by variation of the rate of cooling of different portions of the newly ejected shell. Shell investing and curing conditions and sand-resin mixes greatly affect the degree of plasticity of a shell at the time of ejection. If a very flexible or plastic shell is immediately placed face down on a flat surface for ten to 15 seconds, it will tend to level out.

How to Keep Shell Flat

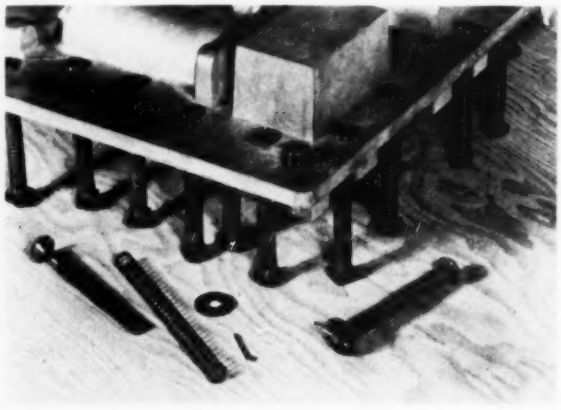
One of the best aids toward keeping a shell flat, particularly around the edges is the following: raise the outer perimeter of the pattern plate, or of the frame around it, above the plate surface. A ¼ in. high ledge is usually sufficient. The inside edge of the ledge determines the outline of the shell, and on it, generous draft should be allowed, such as five, ten, or 15 degrees. The top of this inside edge should match up with the inside of the dump box, or investment chamber adaptor, if pattern is run on a shell molding machine. This ledge prevents peel-back, which sometimes occurs when the pattern and invested shell are removed from the investment chamber. There is also no tendency to curl in curing with this raised ledge.

Larger patterns which have some depth above the parting line usually create straighter shells. The vertical shell section around the edge of the pattern acts as a rib, holding it flat. Runner and sprues have the same effect to a lesser degree. On extremely flat patterns, it is sometimes advantageous to create a rib by mounting or casting on the plate surface, away from the casting cavity, a rectangular bar. In some cases, the use of these bars around one half of the shell and correspondingly matched grooves in the other half, satisfactorily lines up the mold.

The mounting or casting of gating on a pattern plate is definitely part of a patternmaker's job. However, there are many who feel that the responsibility for design of this gating and the arrangement of the



Cast iron plate with stripper sub-plate. Raised bars around edge of plate help maintain a flat shell surface.



Simple design of ejector pins: they are easily installed and readily replaced.

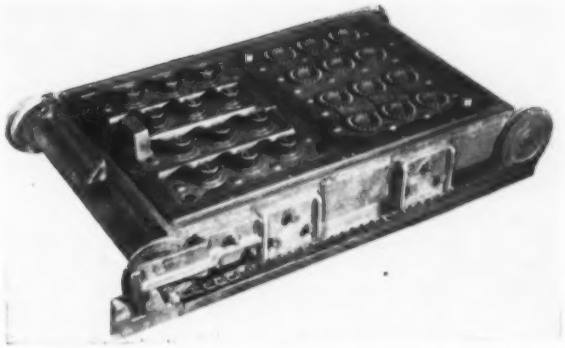
patterns on a plate should also be assumed by the patternshop. The foundry engineer or someone directly responsible for the production of the castings should assume this responsibility. There is nothing mysterious about shell casting gating. It may seem so on the first few attempts to run a specific casting, but the answer will finally appear. Best previous practice and judgment indicate that bottom gating should be used, and in the end, top gating will prove to be the answer.

Vertical Pouring Brings in New Variables

Vertical pouring brings in a whole new set of variables, which can be overcome with trial and patience. One fallacy seems to have gained a foothold: that "shell castings do not have to be fed." Tipping a casting at 90 degrees may change the whole picture, as far as directional solidification and hot spots are concerned. In most cases, yield is improved with shell casting, due to less gating. However, if there is a heavy section in the casting, which will remain molten after the gates are solid, it must be risered, fed, or chilled. One of the principal causes of shell casting defects is the extremely smooth surface of the shell, as compared with a conventional sand mold. This permits the metal to more or less slide into the casting cavity without the retarding, cleansing, or even combing effect of the sand mold surface. The shell castings may show evidence of dross or slag as a result of this condition.

The one reason for emphasizing this point in a pattern discussion is to call the attention to the following: when gating a shell pattern, it may pay to add insurance in the form of slag traps, basins, dirt catchers, or strainers, to avoid scrap castings.

Shell pattern equipment generally costs more to produce than conventional sand foundry patterns. This increased cost has been aggravated by casting accuracy requirements which in many cases are academical. Some common sense is necessary in this tolerance question. Perhaps on small and medium sizes shell castings, all but critical surfaces could stand tolerances of plus or minus 0.010 in. It is usually possible to produce castings which will be true to pattern, within 0.002 in. of pattern size, with a minimum tolerance of about 0.003 in. This, of course, is true only on those surfaces which are contained in one-half of the shell. Relationship between both halves of the shell are dependent upon the accuracy of fit and position of the locators. Tolerances across the parting line are entirely dependent upon the tightness of the joint around the casting cavity, and the support which may be necessary while the molten metal is solidifying.



Raised ledge around of pattern plate helps to eliminate rejected shells. Raised steel strip between patterns permits breaking shell into two mold halves.

A casting is never more accurate than the pattern from which it is made. Higher productivity and closer tolerances in sand foundry practice have called for more skill and ingenuity on the part of the patternmaker. In shell molding, both productivity requirements and casting accuracies are reaching goals never before thought possible. As ever in the past, patternmakers will meet and are meeting the challenge and are providing tools for the job.

Random Thoughts on the 1953 A.F.S. Convention

Every year, A.F.S. declines to name any one hotel as "Headquarters," in the belief that any place foundrymen gather at Convention time is "headquarters." What happens? Fully 80 per cent of the initial hotel applications name one hotel as first choice.

Wonder if that same chap will turn up this year after registration closes May 8 at noon, begging to have his name included as "among those present." Happened several years ago. (Sure we listed him.) Wonder what kind of report he wrote on his return home.

Growing importance and recognition of Safety & Hygiene & Air Pollution Program shows up in four Convention sessions this year . . . all "must" sessions for smart management.

Every Convention produces at least one especially outstanding session. For 1953 we predict: the Sand Reclamation Symposium (six papers sponsored jointly by the Gray Iron, Sand, and Steel Division).

Some foundry managers are hard to understand. They send men only when an Exhibit Convention is held, forgetting other major values: practical round tables and shop courses, data on latest technological advancements, and opportunities for business discussions and exchange of ideas. Pick out the most progressive foundries in the country . . . they are *always* represented. Who's the wiser?

Company and Sustaining members again may register any of their plant employees *in advance* at member registration fees of $2 (guests $5). Every year someone forgets to take adantage of the offer, which *does not* apply during the Convention.

Light Metals Division didn't waste any time broadening its program to include titanium after changing its name from Aluminum & Magnesium Division. On schedule for Convention are four papers on titanium alloys, melting, and mold materials.

1953 Convention Preprint ★

Segregation Study in Bronze

Using a Radioactive Technique

W. C. WINEGARD / *Professor, Met. Eng., University of Toronto*

The segregation of tin in small castings of 10 per cent bronze was investigated by the use of a radioactive tracer technique. Results are reported for various cooling conditions. It is established that inverse segregation does occur in very small castings.

■ The normal segregation that occurs when a large mass of metal is solidified is termed *coring*. The first material to solidify contains a smaller proportion of the solute than the remainder. This means that the outside of a casting will be purer than the center. In some non-ferrous alloys, however, there is a tendency to reverse this type of segregation. The outside of the casting, which is the first part to freeze, may contain more solute than the last part to freeze. When segregation is of this type, it is called *inverse segregation*.

It has long been known that tin bronzes exhibit marked inverse segregation during solidification. A recent review by Pell Walpole and Hanson[1] indicates that this phenomenon has not hitherto been studied by the radioactive tracer technique. The purpose of this paper is to set forth the technique of autoradiography and to show the results obtained with this technique in the laboratory. From the results, it is clearly seen that laboratory tests give a true indication of what actually occur in large castings.

Making an Autoradiography

The autoradiographs in this work were obtained by the use of a relatively simple procedure which has been used by several investigators.[2,3,4] It is necessary, of course, to have one constituent of the alloy radioactive. When the alloy solidifies, the casting is sectioned longitudinally, polished and placed on a photographic plate for several hours. The radioactive material present in the alloy gives off radiation which will affect the emulsion on the plate in the same manner as light does. Thus, an image of the specimen will be reproduced on the photographic plate. If a particular section of the casting contains no radioactive material, then the emulsion under that part of the specimen will remain unaffected.

Preprint No. 53-7. This paper will be presented at a Brass & Bronze Session of the 57th Annual Meeting, American Foundrymen's Society, Chicago, May 4-8, 1953.

If resolution is not too important, the film used can be a coarse grained x-ray film which reacts rather rapidly to the radiation and an autoradiograph may be obtained in a few hours. However, should resolution be an important factor, a finer grained film should be used. Lantern plates may be used for this type of work, and were used in the present investigation. As a general rule, it will take twice as long to produce the same density image on a lantern slide plate as on an x-ray film.

If resolution is of prime importance, then nuclear track plates may be used. Nuclear track emulsions are very fine-grained and thus have a high resolving power. It is possible to actually trace the path of a

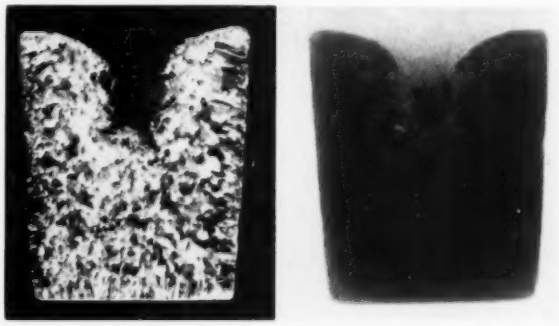


Fig. 1—Macrophotograph (left) and autoradiograph (right) of bronze casting poured in steel mold. X 2/3.

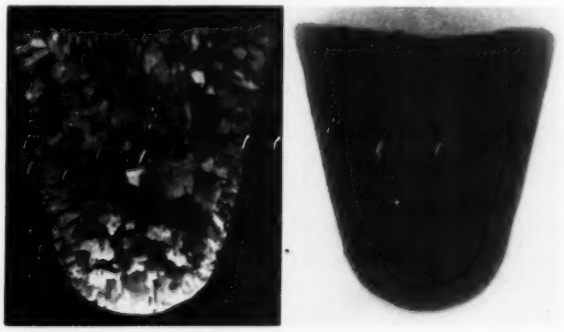


Fig. 2—Segregation is more distinct and columnar zone is deeper in casting poured in ceramic mold. X2/3.

radioactive particle through the film. The particles ionize the emulsion while travelling through it and on development the track of the particle is visible. Nuclear emulsions can be made so that they will only be sensitive to certain energy particles and thus the background fogging of the emulsion will be reduced. Autoradiographs obtained by the use of nuclear track plates usually require an exposure time of about four times that for an x-ray film.

When the casting has been in contact with the film for the required time, the specimen is lifted off and the photographic plate processed in the normal manner. While the casting is in contact with the film, all light must be prevented from reaching the plate. This may be accomplished by loading both plate and specimen into a light tight plastic bag for the exposure.

Use Radioactive Tin

Grade D phosphor bronze (Sn, 10.63 per cent; P, 0.1; Pb, 0.04; Fe, 0.07; Zn, 0.2) was used in the investigations. To this material 0.1 gram of tin containing tin 113, a radioactive isotope, was added. The whole was melted in an electric muffle furnace and allowed to remain at 1080C for several minutes to ensure homogeneity in the liquid. The radioactive tin diffuses through the liquid and behaves exactly the same as the remainder of the tin except for its radiation properties. Three small castings were poured from 1080C. The first melt was poured into a steel mold, the second into a ceramic mold, and the third into a hot ceramic mold with the bottom insulated so that freezing proceeded from the top downwards. Figure 1 shows the macrophotograph and autoradiograph of the casting poured into the steel mold. The darker portions on the autoradiograph show where the tin content of the casting is highest.

Figure 2 is the macrophotograph and autoradiograph of the casting poured into the ceramic mold. The columnar zone is deeper and the segregation, as shown on the autoradiograph, is more distinct. This would seem to indicate that the segregation observed was connected with the appearance of a good columnar zone. This is in accord with other experimental evidence on inverse segregation.

In normal castings, columnar growth occurs in from the sides and up from the bottom of the ingot. It was decided to investigate inverse segregation under conditions where solidification would proceed from the top downwards. This method of solidification was produced by casting into a hot ceramic mold with the bottom of the mold insulated to prevent heat loss. The resulting casting and autoradiograph is shown in Fig. 3. The bottom of the ingot is porous.

The most striking case of inverse segregation observed during this investigation occurred in a small specimen of 10 per cent bronze 2 in. long and ½ in. in cross section. The alloy was heated in a graphite boat using an apparatus similar to that described by Chalmers[5] for the growth of single crystals. When the bronze was molten, the graphite boat was removed from the furnace and solidification occurred from the outside inwards in all directions. The specimen was sectioned, polished, photographed and an autoradiograph was taken. The specimen and the autoradiograph are shown in Fig. 4. The segregation is very marked, the tin-rich material being at the outside region which was the first to solidify.

It is felt that the technique described above may be usefully employed in solving many practical casting problems. It has been shown by several investigators that inverse segregation is more pronounced when melting occurs in the presence of some gases. The study is by no means complete and it seems reasonable to suppose that more quantitative information will be made available by the use of this technique.

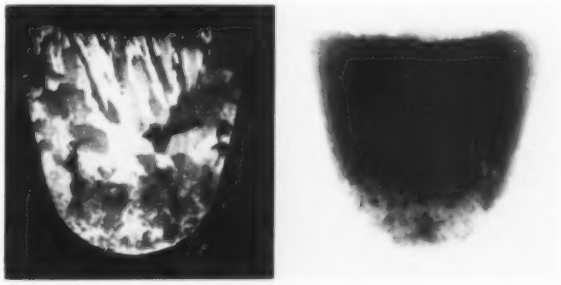


Fig. 3—Casting solidified from top down in hot ceramic mold insulated at bottom to prevent heat loss. X 2/3.

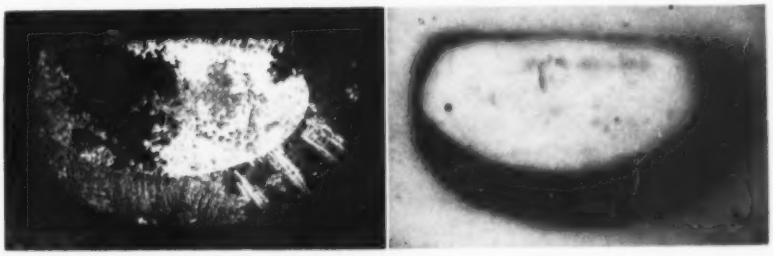


Fig. 4—Bronze specimen cooled in hot graphite boat to make solidification proceed from outside inwards in all directions. Outside region which solidified first is high in tin. About X 5.

Acknowledgments

The author would like to thank Dr. B. Chalmers, Dr. W. R. Thomas and R. S. Davis, for helpful discussion. The help of F. de Maio and R. Urlocker in the preparation and examination of the castings is gratefully acknowledged. The work was supported by the Defence Research Board, Canada, and the National Research Council, Canada.

References

1. Pell Walpole and Hanson, *Cast Tin Bronze*, (1951) Edward Arnold (London).
2. B. Taylor, P. Killaby, and W. C. Winegard, "Segregation During Casting Shown by Radioactive Antimony," AMERICAN FOUNDRYMAN, vol. 22, no. 5, November 1952, p. 59.
3. W. C. Winegard and B. Chalmers, *Canadian Journal of Physics*, vol. 30, September 1952, p. 422.
4. Stewart, Thomas, Wauchope, Winegard, and Chalmers, *Physical Review*, vol. 83, no. 3, August 1, 1951, p. 657.
5. B. Chalmers, *Proc. Royal Society*, A175:100 (1940).

1953 Convention Preprint ★

Hardening Gray Cast Iron With Minimum Distortion

A. A. ARMSTRONG / *Thompson Products, Inc., Cleveland*

Methods of hardening cast iron are discussed showing some of the advantages and limitations of oil quenching and tempering, martempering and austempering. Control of warpage in hardened cylinder liners is discussed with reference to the TTT (time, temperature, transformation) curve. For good wear characteristics, a hardened gray cast iron with random Type A graphite in a matrix of tempered martensite or bainite is recommended.

■ The development and use of gray cast iron for the fabrication of many moving and wear parts throughout the machine industry brought with it the desire for greater strength and greater resistance to wear. To improve these properties and lengthen service life, the through hardening of such cast parts was performed by heating them above the upper critical point and quenching out the matrix structure to produce a hard martensite which upon suitable tempering became tough. Problems of cracking, distortion, shrinkage, collapse, instability of dimension upon ageing in the field and failure of parts to harden have caused the metallurgist to employ many variations of heat treating procedure in order to produce more serviceable parts.

Inasmuch as the hardened structure of gray cast iron parts depends to a very great extent upon the as-cast structure, graphite flake size, distribution and orientation, toughness and composition of the matrix, the first requisite for a good finished part lies with the foundry source in producing a good casting of proper chemistry and soundness, free from large and/or excess carbides, and free from chill.

Having a good sound casting of fine structure, it is important to perform a minimum of heat tempering operations in order to prevent any deterioration of such structure. A stress relief draw of one hour per inch or less of casting thickness, preferably applied after rough machining away the as-cast surface, and after the removal of any major amounts of stock, tends to reduce distortion at the hardening operation, and if performed at temperatures of 800F to 1250F does not seem to appreciably harm the structure.

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Heating cast iron to a minimum hardening temperature tends to promote a more thorough quench out and minimizes the tendency to retain austenite. Raising the austenitizing temperature considerably slows down the transformation of the austenite on quenching and may result in retained austenite which will often gradually transform at a later date causing distortion.

Oil and water quenching followed by the tempering of simple uniformly proportioned parts is often satisfactory; however, distortion, warpage, and cracking rapidly appear as the part sections begin to vary and become more complicated.

Use Isothermal Treatment

Efforts to reduce quenching strains point to the use of some isothermal process, which will condition the thick and thin sections of a part so that the final desired quenched matrixstructure, may be attained as quickly and as uniformly as possible throughout the entire piece . . . quickly, in order to make the operation commercially feasible and economical and also to attain some high degree of hardness as uniformly as possible, in order to minimize the tendency to form hard expanding martensite needles in thin sections, while such transformation has not yet begun in the heavier more plastic sections. These hard and highly stressed sections, if permitted to develop as they are in the normal hardening operation, will often cause such extreme stresses as to rupture or render the part useless from a distortion standpoint.

An isothermal treatment refers to a process at a fixed temperature level for sufficient time to permit the part or parts to attain a uniform temperature and often a uniform metallurgical structure throughout. In isothermal heat treatments this is often obtained by quenching parts directly from the hardening temperature into liquid salt, oil or metal baths, maintained at constant temperatures considerably above room temperature. This may be followed by either a rapid quench to room temperature, an isothermal quench at a higher temperature, or an air cool to room temperature. The following example demonstrates such a treatment and its advantages.

Figure 1 shows a thin, dry, cast iron cylinder liner of the type used in commercial internal combustion engines. This is a hardened liner calling for a

hardness of Rc 47-52. The casting has been finish machined leaving only grinding and honing stock for removal after the hardening operation. Thus, most of the stock removal has been performed in the soft or as-cast state with ease and speed. Table 1 illustrates the relative amounts of distortion experienced by a direct oil quench and air draw for 1 hour at 600F after preheating at 1250F for six minutes, and austenitizing at 1500F for eight minutes in neutral salt baths compared with the distortion experienced with the same preheat and austenitizing procedure followed by an isothermal quench of 28 minutes at 480F, a water wash and a 1 hour air draw at 600F, both hardening operations having been performed with the parts in the same free state.

The data in Table 1 show the slight amount of distortion inherent in the thin parts as they are received ready for the heat treatment. The out-of-round figures under the oil quench heading points out not only a large amount of distortion but also a large variation in the amount of distortion. Tempering has to some slight extent reduced this distortion but the necessary stock removal for clean-up is large, varies from piece to piece, and is difficult machining because of the hardness.

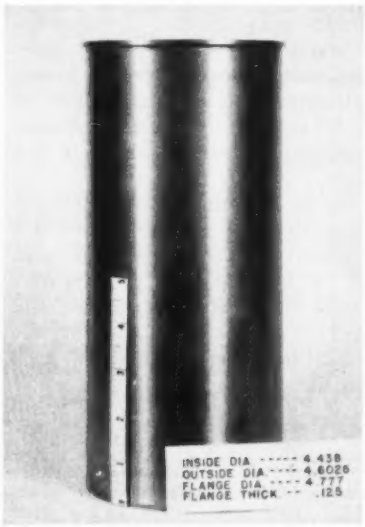


Fig. 1—Cast iron cylinder liner (left) is finish machined prior to hardening, leaving only grinding and honing stock. Table 1 shows distortion in hardening.

Fig. 2—Slide areas of machine tool fixture are hardened to same level by isothermal quenching.

A comparison of the isothermally treated parts shows: (1) Much less total distortion; (2) Much less variation in the amount of distortion from piece to piece; (3) Much less distortion relative to the thick and thin sections of the parts; and (4) Practically no further change in dimension with the draw operation. These facts all tend toward a more uniform stock removal at final grinding or honing and permit a closer control on machining operations presenting a more efficient method.

Figure 2 pictures a machine tool fixture with slide areas 1 and 2 required to have a hardness of Rc 48-52 when this part is made of gray cast iron. Little or no trouble is experienced in through hardening it to obtain the desired hardness on area 1 but hardness of Rc 38-42 can be expected in areaway 2 together with some distortion, unless the quenching technique is varied so that the various sections of the part travel through the Ms critical at somewhere near the same time.

Isothermal quenching reduces the central mass heat level and enables the whole part to be more thoroughly quenched out at once. The higher desired hardness can then be obtained in the recessed areaways. Drawing hardened work for 1 hour per inch or less of thickness produces a stable serviceable part.

Figure 3 from data of E. F. Houghton Co.[1] diagramatically represents four important quenching methods as related to the time, temperature, transformation curves. The first graph represents the normal oil or water quench to form martensite and to temper it to the desired hardness.

The second graph shows the martempering method where the part to be hardened is quenched into a bath slightly above the Ms point only long enough to equalize the temperature throughout the part and then quench it to room temperature forming martensite which is then tempered to the desired hardness.

The third graph demonstrates austempering with a quench higher up above the Ms point 600F to 900F for a sufficient time to complete the transformation into bainite and cool the work to room temperature without including a tempering operation.

The fourth method portrays an isothermal quench followed immediately by an isothermal draw at a higher temperature.

It is well at this time to examine the S or TTT curves for cast iron. Figure 4 is a graph showing S-

Table 1—DISTORTION OF THIN CYLINDER LINERS

	Top		Bottom	
	ID	OD	ID	OD
Before Heat Treatment				
Average Out of Round	.002	.001	.003	.001
After Oil Quench				
Maximum Out of Round	.018	.020	.064	.065
Minimum Out of Round	.003	.005	.020	.007
Average Out of Round	.012	.012	.040	.033
After Isothermal Quench				
Maximum Out of Round	.014	.009	.009	.005
Minimum Out of Round	.003	.001	.003	.002
Average Out of Round	.008	.006	.006	.003
After Oil Quench and Draw				
Maximum Out of Round	.017	.023	.061	.071
Minimum Out of Round	.006	.004	.012	.019
Average Out of Round	.011	.010	.039	.025
After Isothermal Quench and Draw				
Maximum Out of Round	.014	.008	.007	.005
Minimum Out of Round	.003	.003	.003	.003
Average Out of Round	.008	.005	.005	.004

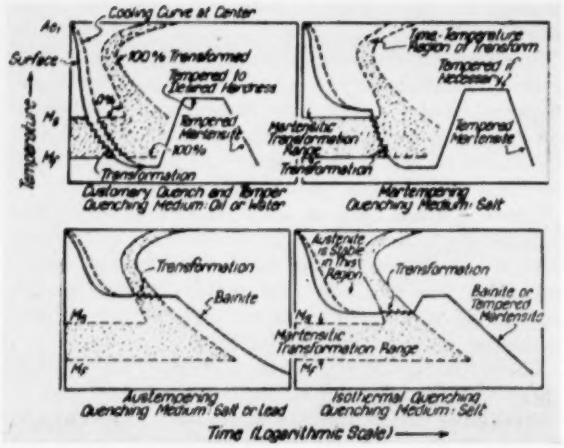


Fig. 3—Four quenching methods related to TTT curves.

curves for low alloy gray cast iron prepared from the work of C. R. Austin.[2] Superimposed upon this graph is curve 3 which represents a martempering hardening cycle such as is most commonly applied today. From curve 3 (Fig. 4) one can see that the total isothermal furnace time is reasonably low exclusive of the draw operation which can readily be an air draw.

For example, a gray cast iron part with a maximum thickness of one-half inch could be martempered by preheating for six minutes at 1250F, austenitizing for eight minutes at 1500F, marquenching for 12 minutes at 480F cooling to room temperature and tempering 1 hour at temperature. This procedure can be expected to produce a stable finished part of maximum hardness and minimum distortion. Hardness of R_C 47-55 may be expected depending upon the initial structure of the casting. The matrix structure of the finished part will be tempered martensite.

Curve 4 (Fig. 4) demonstrates an austempering cycle featuring a 600F isothermal austempering quench requiring approximately 9,000 seconds or 2½ hours for its completion. Further tempering is not required to stabilize the matrix structure which will be tempered martensite and bainite with a hardness approximately equal to a normally hardened part with a 600F tempering treatment. If a lower matrix hardness is desired, an isothermal draw at an elevated temperature may immediately follow this austempering cycle. The advantages of this cycle lie in the ability to harden parts without the formation of martensite and its accompanying expansion which may cause distortion and cracking.

However, in the use of Fig. 4, it is well to remember that these curves are representative of low alloy gray cast iron and may be considerably displaced by variations in both amount and type of alloy content. This increased alloy content may raise or lower the Ms transformation and will suppress the S-curves so as to lengthen the transformation time. It is, therefore, possible with increased alloy content to underestimate the transformation time and particularly in an austempering cycle to end up with a product containing retained austenite later transformed into untempered martensite.

In conclusion, it can be said that a through hardened gray cast iron part having a good random distribution of Type A graphite size 4 to 6 in a stable, well-tempered martensitic or bainitic matrix containing no retained austenite or untempered martensite and having enough alloy of the proper kind to produce the necessary strength and toughness will show good service and long wear life.

References

1. *Houghton on Quenching* (1952). E. F. Houghton Co.
2. C. R. Austin, "Isothermal Heat Treatment of Meehanite Metal," *Metal Progress*, August 1952.

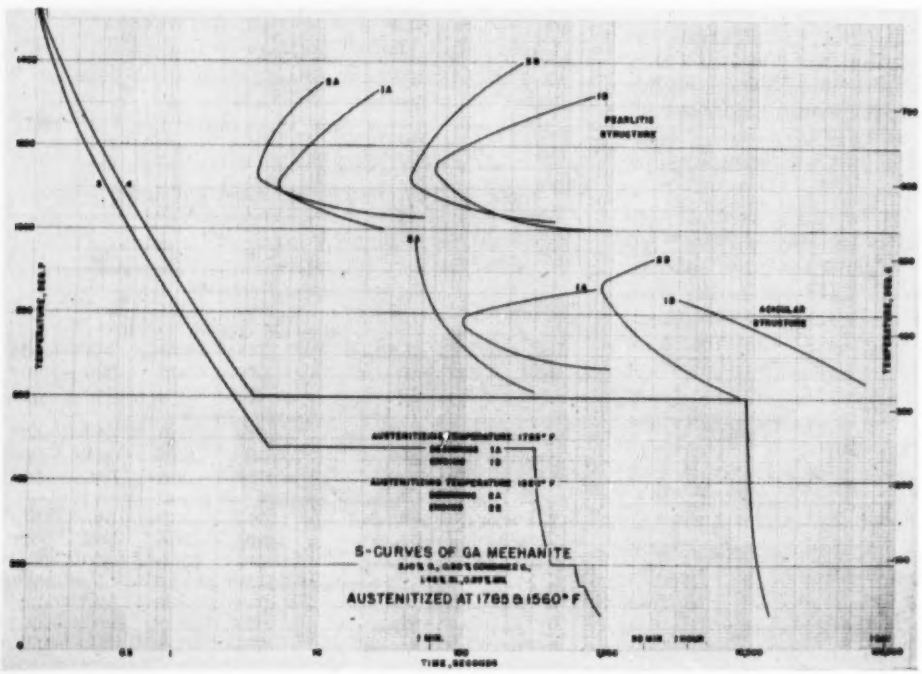
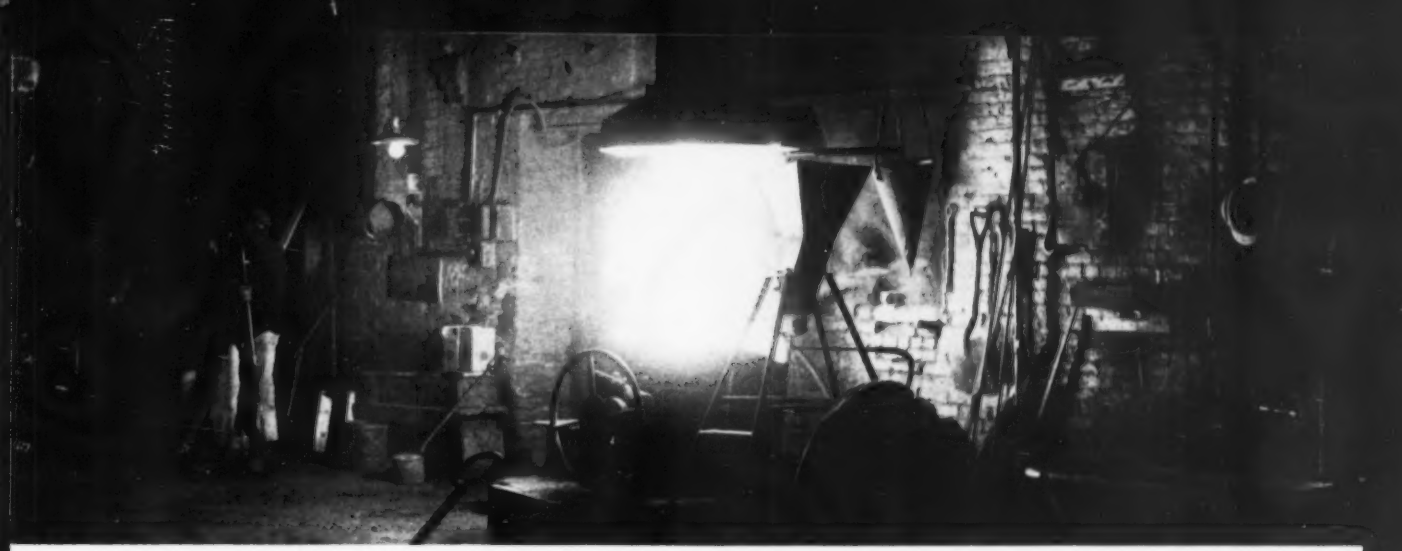


Fig. 4—S-curves for low alloy, inoculated gray iron with martempering hardening curve (3) and austempering cycle (4) shown. Curves can be considerably displaced by composition changes.



Fumes and smoke generated by production of ductile iron at Sacks-Barlow Foundries, Inc., Newark, N. J., are exhausted to the outside. Workmen are protected from light and glare by glasses or by looking away from ladle.

Safety Practices in the Production of Ductile Iron

ROBERT E. SAVAGE / *Dev. & Res. Div., International Nickel Co., New York*

Health and safety hazards of producing ductile iron are no greater than in the production of gray iron if recommendations in this article are followed. The information was originally presented at the A.F.S.-University of Illinois conference on safety, hygiene, and air pollution. This and the other 13 conference papers will appear soon in a special publication. *Health Protection in Foundry Practice*, based on a previous conference, is already available.

■ Ductile iron, a newcomer to the list of metals available for use by industry, has been in commercial production for approximately three years. Currently, over 100 companies in the United States and Canada are licensed to produce ductile iron by International Nickel Co., Inc., of the United States and over 100 companies in the other countries of the free world licensed to produce ductile iron by Mond Nickel Co. Ltd. of England. Extensive literature[1] exists on the mechanical and metallurgical properties, as well as the applications, of ductile iron since the discovery of this metal was announced in 1948.[2]

What It Is

Ductile iron is a member of the ferrous family of metals. It is produced in the foundry using typical melting units such as basic or acid lined cupolas, direct or indirect arc electric furnaces, induction furnaces, or air furnaces. Ductile iron can be cast in green sand molds, dry sand molds, shell molds, or permanent molds. It has the process advantages of cast iron combined with product advantages of cast steel. A range of the chemical composition is: carbon, 2.5-4.4 per cent; silicon, 1.0-6.0; manganese, 0.10-1.0; phosphorus, 0.1 max.; and magnesium, 0.10 max.

The chemical composition of ductile iron is similar to gray cast iron, except for the magnesium content; however, a radical difference is apparent from examination of the two microstructures. The carbon present in gray cast iron is present in a flakelike form, while in ductile iron it appears in a spheroidal form. This change in the carbon structure is caused by the incorporation of an effective amount of magnesium. Accordingly, the mechanical properties of ductile iron are greatly improved over those of gray cast iron. The range of mechanical properties is:

	Minimum	Maximum
Tensile Strength, psi	60,000	250,000
Yield Point, psi	45,000	200,000
Elongation in 2 in., %	3	30
Brinell Hardness Number	140	600

The discussion in this paper will deal with the hazards involved when magnesium is added to iron, thereby producing ductile iron.

Foundrymen have been adding nickel, copper, molybdenum and other heavy metals with high melting points to cast iron, with little or no difficulty over a period of many years. However, the problem is more

This 13-ton die shoe was safely cast by Beloit Foundry Co., Beloit, Wis., using recommended precautions.

difficult when they attempt to add magnesium—which has a relatively low melting point and boiling point—to cast iron. Magnesium vaporizes at 2030F and has a specific gravity of 1.74. Iron with a specific gravity of 7.87 is melted in the foundry in the temperature range of 2500 to 2900F. Ductile iron solidifies at approximately 2100F which is above the vaporization temperature of magnesium. Magnesium vapor will oxidize readily in air.

Most foundries produce ductile iron by adding an alloy which contains magnesium to iron. Common metals which are alloyed with magnesium for this purpose are nickel, copper, silicon, and iron. The figure at the head of this article shows a photograph of a typical operation in a foundry producing ductile iron. Examination of this photograph will be helpful in the evaluation of the additional safety and health practices which are recommended for safe foundry operation.

When magnesium alloys are added to iron, some of the magnesium will burn in the air and some of the magnesium will be retained in the iron. The oxidation of magnesium in the air generates heat, light and fumes. The heat and light will be similar to that produced by a flash bulb used in photography or signal flares used in warfare. The amount of heat, light and fumes produced is proportional to the amount of magnesium which burns in the air. Undoubtedly, the commercially used method of adding magnesium to gray cast iron will be improved as time passes so that less magnesium burns in the air.

Hazards In Production

In general, no new foundry problems are encountered in the production of ductile iron that were not already present in the foundry. However, the magnitude of some problems has been increased. Four general problems are involved:

A. Metal splash or burn problems.
B. Fume problem.
C. Heat problem.
D. Light problem.

Each of these problems will be discussed under a separate heading. In all cases, the influence of magnesium is discussed since the presence of magnesium in the alloys produces the above problems which the foundrymen must consider.

Metal Splash or Burn Problems

Iron is usually poured from one ladle into a second ladle in the production of ductile iron. When the magnesium reaction occurs, it is possible to have an occasional particle of iron or magnesium splash out of the ladle as this operation is performed. The danger from metal splash or burn in this operation is no greater than that occurring when iron is poured into an improperly dried ladle.

Precautions similar to those exercised by ladle men in iron and steel foundries for preventing burns from metal splash should be taken in this case. Of course, for maximum protection in all cases, the following suggestions are given:

1. The body should be protected with asbestos or fireproof clothing, including shirt, trousers and cap.
2. The face should be protected with a face shield and the eyes with goggles to prevent metal particles from striking the face or eyes.
3. The clothing may be fireproofed with a compound such as ammonium sulfamate.

If a burn should be caused by magnesium in this operation, it would be similar to any other second or third degree burn. Jarzynka[3], who has had five years of experience with magnesium metal in fabrication, has seen some 73 major burns caused by magnesium and insists that they differ in no respect from the usual second or third degree burns.

Fume Problem

The fume problem arising in ductile iron production is not a new one to the foundry industry, since foundrymen encounter fumes in the core rooms, pouring areas, and shakeout areas. Foundries handle the current fume problem without difficulty by having adequate ventilation in the necessary working areas.

The production of ductile iron generates fumes; however, this condition can also be controlled with adequate ventilation. The fumes generated are composed principally of magnesium oxide resulting from the oxidation of magnesium in the air. It is strongly recommended that ductile iron be produced under a hood in one specific area of the foundry. Thus, ade-

quate ventilation facilities with atmospheric exhaust blowers can be installed in this area to remove the fumes generated in the process and to prevent them from settling in the foundry.

Magnesium oxide fumes will reduce visibility in the foundry if the fumes are present in large amounts. The hazard caused by poor visibility can be removed by proper ventilation. Companies specializing in foundry ventilation have adequate equipment for handling the fumes in this process.

If all the fumes are not carried out of the foundry, then the problem of inhalation of these fumes by the worker must be considered. Drinker states that magnesium oxide is one of the substances which in freshly formed fume causes metal fume fever.[4,5]

There has been only one reported case of metal fume fever among all the licensee foundries, both in the United States and abroad, since the inception of ductile iron. This case was reported in England. The person was affected by metal fume fever after inhaling an excessive amount of magnesium oxide fume over a prolonged period of time. The worker's recovery was complete after a short period of discomfort.

A maximum allowable concentration[6] of magnesium oxide fume has been set by the 1949 American Conference of Government Industrial Hygienists at the 11th annual meeting in Detroit at 15 milligrams per cubic meter. If it is necessary to protect the worker in concentrations of magnesium oxide fumes greater than the maximum allowable, a U. S. Bureau of Mines Type B mechanical filter respirator of the air purifying type will protect him. The filter will not be effective in the presence of an oxygen deficiency.

Causes No Lung Damage

The electron microscope shows solid magnesium oxide particles deposited on a surface which was passed over a magnesium flame; the magnesium, burned in air, formed small cubes of various sizes (page 148).

No report of lung damage, similar to silicosis, due to inhalation of magnesium or magnesium oxide, could be found in the literature. However, dust of magnesium oxide is somewhat irritating to the nose and throat. At present, this is not considered to be a serious problem.

Pure magnesium oxide apparently has no irritating effect upon the skin, and is used as a dressing powder, as is talc. There have been no reports of magnesium oxide fumes causing skin irritation.

It may be well to emphasize again that there have been no reports received by International Nickel Company concerning difficulty of workers with skin irritations or lung irritations since the beginning of commercial ductile iron production in the United States over three years ago.

Generate High Heat

Considerable heat is generated when magnesium burns in the air. This reaction can be represented by the following equation:

$$Mg\ (solid) + 1/2\ O_2\ (gas) = MgO\ (solid) + 10{,}900\ Btu/16\ Mg$$

When one pound of magnesium burns as shown in this equation, approximately 10,900 British thermal units of heat are generated. In the production of castings of ductile iron weighing over 100,000 pounds, it is possible to have 120 pounds of magnesium burn in air. Thus, approximately 1,308,000 Btu of heat are generated, causing a rapid rise in the temperature of the air in the vicinity of the reaction. It is necessary to protect the foundry equipment and foundry personnel from this. Of course, smaller additions of magnesium alloy for smaller castings will produce proportionately less heat.

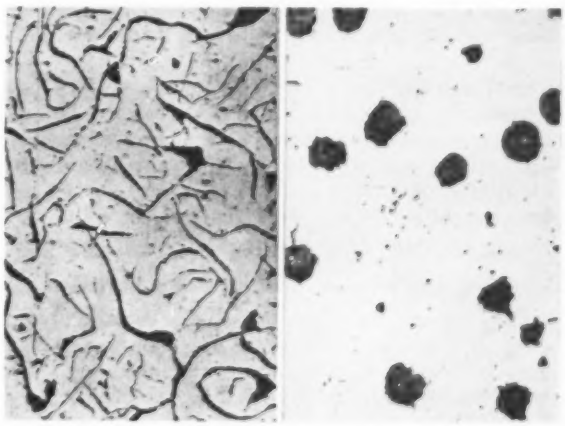
It is recommended that the iron be treated every time in the same area of the foundry. Thus, it is possible to have this treatment area shielded from the remainder of the foundry with a sheet steel or asbestos shield. The shield will protect the foundry workers and foundry equipment from the heat. The sheet steel should not be galvanized since the zinc coating may oxidize and burn from the heat of the magnesium reaction.

Isolate Reaction Ladle

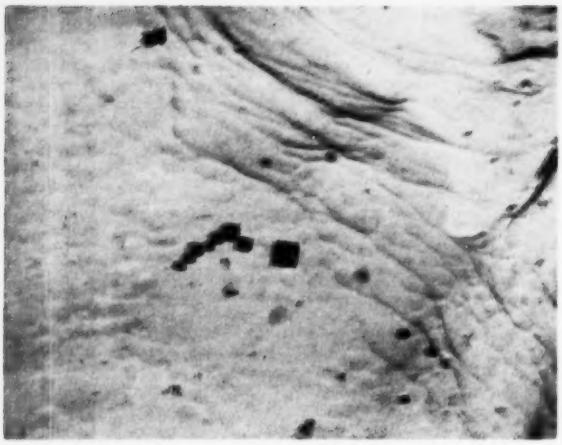
If the treating area is near electrical equipment or crane cables, they will require some protection from the generation of heat and temperature rise. However, the safest procedure consists of setting the ladle on the floor in the treating area away from the foundry equipment. The suspension system should be removed from the ladle prior to the magnesium reaction. In this way, the problem of foundry equipment protection is minimized. If these practices are not possible, the use of a shield placed between the ladle and the foundry equipment will protect the equipment to a certain extent.

There has been one report of failure of a wire cable in a suspension system used when ductile iron is produced. The cable was repeatedly overheated during the magnesium reaction and its tensile strength was lowered. The cable failed, but no one was hurt by this accident. With this information in mind, the electrical equipment and crane cables should be periodically inspected if they are exposed to the heat to insure that they are in satisfactory working order.

Magnesium burning in air gives off a continuous spectrum of light. Wave lengths of light are given off



Flake graphite (left) and spheroidal graphite (right). Microstructures are unetched, about X100, reduced 60%.



Magnesium oxide (small black cubes) produced by burning magnesium in air. Taken with electron microscope, X14,000, by Dow Chemical Co., Midland, Mich.

in the ultra violet, visible, and infra red spectrum. It is important that the workers' eyes be shielded from the ultra violet light just as a welder is protected from the welding arc. The major wave lengths of the emission spectra of arced or sparked magnesium up to 25,000 Ängstrom units are given in the *Handbook of Chemistry and Physics* (1951-1952 Edition). Eye cup goggles properly fitted with colored filter lenses which meet the light absorption and transmission requirements will protect the eyes from normal glare and abnormal light rays.

Screen Ultra Violet Rays

An eyeglass which absorbs the ultra violet light while transmitting only a portion of the visible light is the type recommended to protect the worker from light generated by burning magnesium. The bright flare of burning magnesium occurs at about 5160 to 5520 Ängstrom units. The use of a red glass[8] approximately 2.0 millimeters thick will transmit about one per cent of this visible light which causes flare and none of the ultra violet light.

Workers not specifically connected with the production of ductile iron will be best protected by remaining at a reasonable distance from the magnesium treatment area. The head can be turned at the beginning of the reaction, thereby protecting the workers' eyes from the ultra violet light and glare. Workers have occasionally reported headaches immediately following the magnesium treatment. The headache would last only for one or two hours. It is quite possible that the magnesium glare visible to the unprotected eyes has caused the temporary headache, just as a headache may be caused by exposure to bright summer sunlight.

Handling and Storage Hazards of Magnesium Alloys

Gay[9] reports that there have been remarkably few cases of dermatitis caused by the handling of magnesium or its alloys. No cases of dermatitis caused by handling magnesium alloys used for the production of ductile iron have been reported to International Nickel. It is possible, although extremely improbable, that a sliver of magnesium alloy could pierce the skin. Magnesium alloys are usually rounded and have no sharp edges, therefore, their chance of piercing the skin is extremely remote.

There is a wide difference of opinion among research personnel regarding the effects of magnesium embedded under the skin. *Industrial Toxicology*[6] reports that wounds, scratches or cuts caused or contaminated with magnesium or its alloys, are especially prone to become severely inflamed. It was possible to produce gaseous tumors in animals by injecting particles of magnesium under the skin. Gay[9] reports that as a foreign body, magnesium may be said to be more inconvenient (because of evolution of gas and local tissue necrosis), but no more harmful than foreign bodies of other materials. Bacterial contamination may be carried into a puncture wound as readily by magnesium as by any other foreign material. It is safe to say magnesium slivers under the skin should be removed as soon as they are observed.

Ammonia Odor No Cause for Alarm

Reports indicate that ammonia fumes are sometimes given off when a drum of magnesium alloy is first opened in the foundry. This is undoubtedly caused by the reaction of magnesium nitride with water to form magnesium hydroxide and ammonia:

$$Mg_3N_2 + 6H_2O = 3Mg(OH)_2 + 2NH_3$$

The magnesium nitride was produced by the reaction of magnesium with nitrogen inside the closed metal drum during shipment. This reaction can be represented by the following equation:

$$3Mg + N_2 = Mg_3N_2$$

There may be a faint smell of ammonia when a new drum is opened but this will produce no particular safety or health hazards.

Magnesium will burn with a rapid evolution of heat. Magnesium flares are used during wars for the purpose of lighting an area for night fighting. Magnesium bombs are used to start incendiary fires. However, magnesium, in the form of magnesium alloys, with relatively low magnesium contents as used by foundries in the production of ductile iron, will introduce little danger from fires if certain precautions are observed.

Observe Storage Regulations

The Interstate Commerce Commission has set up shipping regulations for interstate shipment of pure magnesium. These regulations are given in Section V, Shipping Regulations, Interstate Commerce Commission (Bureau of Explosives), Articles 153 and 173. The magnesium alloys should be shipped and stored in closed metal drums.

Apparently the main danger from fire with the magnesium alloys lies not with spontaneous combustion but rather with their possible combustion if the foundry building has already caught on fire. The magnesium alloy will burn if it becomes hot enough.

It is recommended that the magnesium alloy be stored in non-combustible buildings if possible. The magnesium alloy should be stored in closed metal drums which should not be opened until their contents are needed. Drum storage should be restricted to the

Man pouring ductile iron need observe only the normal iron foundry precautions to protect against splash, spills, and radiation.

first or ground floor level. There should be no basement or depression below the magnesium alloy storage into which water or molten metal may flow or fall during a fire.

Methods of fighting magnesium fires have been described in detail in the literature.[10,11,12,13] However, one point should be kept in mind. At high temperatures, magnesium reacts violently with water, forming magnesium oxide and hydrogen. Therefore, magnesium fires can not be fought by the conventional water methods.

Remove Magnesium Alloy

If the storeroom should catch on fire, it would be advisable to remove the magnesium alloy from the immediate area. If this is not possible, the magnesium fire can be fought with several proprietary powders,[10] boron tetrachloride gas, or mixed chloride fluxes. Solid streams of water, vaporizing liquid, foam, dry chemical or carbon dioxide type extinguishers should not be used on a magnesium fire.

No fire, either caused by magnesium alloys or in which magnesium alloys were ignited, have been reported to International Nickel Co. by licensee foundries since the first commercial production of ductile iron.

Conclusions

The production of ductile iron introduces no new safety or health problems to the foundrymen. However, the foundrymen should exercise reasonable care, use common sense, follow safe practices and have a thorough knowledge of the ductile iron process in order to eliminate the hazards to the worker.

The major safety problems which should be considered are: (1) Metal splash and burn; (2) Evolution of fumes; (3) Generation of heat; (4) Generation of light; (5) Handling and storage of magnesium alloy.

By following the suggested health and safety practices as outlined in this paper, it is firmly believed that a foundry can produce ductile iron with no greater personnel health or safety hazards than when they produce gray cast iron.

References

1. Charles C. Reynolds and Howard F. Taylor, "Mechanical Properties of Spherulitic Graphite Cast Iron," *Transactions, American Foundrymen's Society*, vol. 60, pp. 687-713 (1952). Contains 350 references on ductile iron in bibliography.
2. Discussion by T. H. Wickenden, H. Morrogh, "Production of Nodular Graphite Structures in Gray Cast Irons," *Transactions, American Foundrymen's Society* vol. 56, pp. 72-90 (1948).
3. F. J. Jarzynka, "Magnesium in Industry," *Industrial Medicine*, vol. 12, p. 427 (1943).
4. P. Drinker, M. R. Thomson, and J. L. Flinn, "Metal Fume Fever," *J. Industrial Hygiene and Toxicology*, vol. 9, p. 98 (1927).
5. K. R. Drinker and P. Drinker, "Metal Fume Fever—Results of Inhalation by animals of Zinc and Magnesium Oxide Fume," *J. Industrial Hygiene*, vol. 10, p. 56 (1928).
6. Lawrence T. Fairhall, *Industrial Toxicology* (1949), Williams and Wilkins Co.
7. Jack E. Weiss, *1021 Answers to Industrial Health and Safety Problems* (1943, Occupational Hazards, Inc., Cleveland.
8. Private communication, Bausch & Lomb Optical Co., Rochester, N. Y.
9. Harold H. Gray, "Health Aspect of the Magnesium Industry," *Iron Age*, December 3, 1942.
10. "Magnesium Alloys," National Safety News, June 1942.
11. "Magnesium Fires," National Board of Fire Underwriters, Bulletin No. 208, February 1, 1945.
12. "Fighting Magnesium Fires," National Board of Fire Underwriters, Bulletin No. 209, February 15, 1945.
13. "Standards for Magnesium," National Fire Protection Association, Boston, June 1952.

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High-Temperature Immersion Thermocouples

E. T. MYSKOWSKI AND H. F. BISHOP / *Metallurgists, Naval Research Laboratory, Washington, D.C.*

Foundry use of immersion thermocouples has become relatively common for measuring the temperature of molten metals which are not heated above 2100 F. The authors report how the Naval Research Laboratory has overcome the deterrents to use of thermocouples for molten metals above 2100 F, their refinements in technique, and precautions which should be observed for maximum accuracy.

■ The precious metal Pt:Pt-Rh couples required for use at temperatures above 2100 F are considerably more expensive than the base metal chromel-alumel couples used below 2100 F. Precious metal couples are also normally more suspectible to contamination than base metal couples, and thus require greater care in service. In addition, the voltage generated by Pt:Pt-Rh couples is much less than that generated by chromel-alumel couples and hence more sensitive recording instruments are required.

Precious metal, immersion type thermocouples have been used in the experimental foundry at the Naval Research Laboratory for several years both as a research tool and as a means of controlling melting and pouring practices. For example, thermocouples suitably placed in solidifying castings and molds have permitted a more complete understanding of solidification phenomena than was possible with indirect approaches used in the past and have replaced spoon and fluidity tests and optical pyrometers to control pouring temperatures.

The pyrotechnic assembly consists essentially of three components: (1) the thermocouple and its protection; (2) the connection between the couple and the temperature indicator; and (3) the indicator itself. Each of these components will be discussed separately.

Thermocouple and Thermocouple Protection

To minimize contamination of Pt:Pt-Rh thermocouples, contact with metal or reducing gases should be avoided. Fused quartz tubing because of its very high softening point, excellent thermal shock resistance, and ease of handling has proven a satisfactory protection for couples. The end of the tubing is easily sealed by rotating it in an oxy-acetylene flame. The quartz sheath should be as thin as possible to minimize lag in the response of the couple to thermal changes. In a standard thermocouple assembly, the ID of the quartz tube should be only large enough to hold the two-hole alundum tubing which is used to separate the thermocouple wires, while the OD should depend upon the condition to which the couple is exposed.

The oval shaped two-hole insulating tubing used at the Naval Research Laboratory has a maximum cross sectional dimension of 1/8 in. which requires

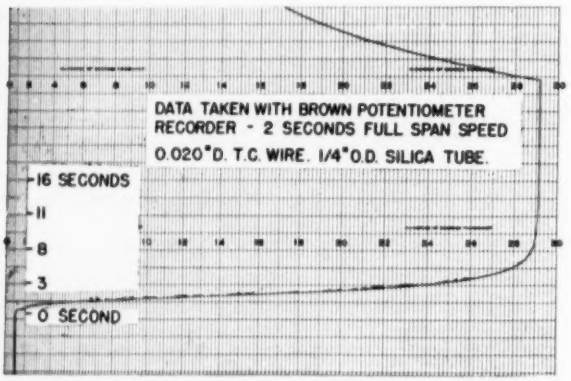


Fig. 1—Time required for cold immersion thermocouple to reach temperature of steel bath.

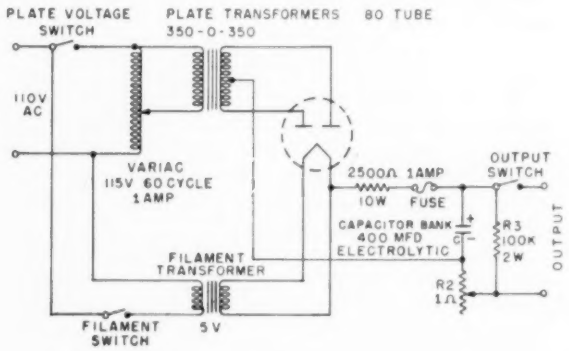


Fig. 2—Circuit diagram of thermocouple flash welder for use in butt welding hot junctions.

that the quartz tubing have an ID slightly greater than $\frac{1}{8}$ in. For the various applications at this Laboratory, it has never been necessary to use quartz tubing with an OD greater than $\frac{1}{4}$ in. A cold thermocouple protected with $\frac{1}{4}$-in. OD quartz will, when immersed in molten steel, reach the correct temperature in approximately 13 seconds as shown in Fig. 1. This response time is sufficiently fast for the measurement of furnace or ladle temperatures or for following the cooling cycles of large castings which change temperature slowly.

Can Use Tiny Quartz Tubing

However, when it is necessary to measure temperatures in thin castings or in cast sections adjacent to chills, a faster response time is desirable. Fortunately, since the metal under these conditions remains molten for only a short time, the quartz tube is subjected to conditions which cause softening and bending for only a relatively short time and smaller quartz tubing provides adequate thermocouple protection. In such cases, it is the practice to use quartz tubing having an OD as small as $\frac{1}{16}$ in. Tubing of this type is used, open at both ends with one of the couple wires extending from each end and the wires are joined within the tube to form the hot junction. This practice eliminates the use of alundum tubing for electrical insulation.

The thermocouple assembly comprising the quartz, alundum, and wire must necessarily absorb heat from the metal surrounding it. When the assembly is located in thin sections where the total heat content is low, it may absorb sufficient heat to cause excessive cooling of the metal unless its mass is kept at a minimum. For this reason, it is desirable to use fine thermocouple wire and to keep the bead and remainder of the assembly as small as possible. A wire having a diameter of 0.015 in. is sufficiently heavy for most uses and a properly made thermocouple should have a bead whose diameter is only slightly larger than that of the wire.

In the conventional couple where the wires leading to the hot junction are parallel, the bead is formed by bending the tips of the wire so that they touch one another and then welding them together with a highly oxidizing oxy-acetylene flame. In the second case where the fine quartz tubing is used for protection, the best procedure for forming the bead is to rapidly butt the two wires together within the tube

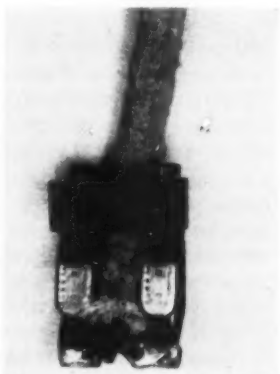


Fig. 3—Jaw clip connector between compensating leads and thermocouple. Leads are wired directly to jaw so body of clip is not part of circuit.

Fig. 4—Round chart, single-point recorder (right) gives instantaneous temperature in furnace or ladle and also makes permanent record of readings.

while their opposite ends are connected to the leads of a flash welder.

Flash welding of thermocouples is accomplished by charging a battery of condensers (Fig. 2C), having an available capacity of approximately 350 to 400 microfarads, to voltages between 50 and 450. The intensity of the discharge is controlled by the variable resistance (R_2) or by changing the voltage to which the condensers are charged by means of the variac. During this operation, the welder should be in the discharge phase. After the bead has been formed within the tubing, the assembly can be bent in a flame to any desired shape in order to facilitate the placing of the hot junction at the desired point in the casting.

Use Compensating Lead Wires

Compensating leads which are used to connect the Pt:Pt-Rh thermocouples to the recording instrument are composed of two wires, one consisting of Cu and the other of a Cu-Ni alloy, which have the same temperature-EMF relationship as do the Pt:Pt-Rh thermocouple wires. Each individual compensating lead wire, however, does not have the same thermoelectric properties as the thermocouple wire to which it is attached and in effect creates another couple at the point of junction.

If the temperatures at both of the thermocouple wire-compensating lead junctions are the same, the voltage generated at each of the junctions will be identical in value but in opposite direction resulting in no EMF change in the system. If the temperatures at the junctions are different, the voltages generated will be of different magnitudes and, depending upon which junction is the hotter, will result in an increase or a decrease in the voltage registered at the meter and thus in the indication of an erroneous temperature.

Alligator type copper clips, electrically separated by bakelite spacers (Fig. 3) are used to form the junction between the thermocouple and compensating lead. The thermocouples are connected into the circuit clamping each wire into the proper clip. It will be noted from Fig. 3 that instead of fastening the compensating lead wires to the screws at the ends of the clips as is normal practice, the lead wire terminals

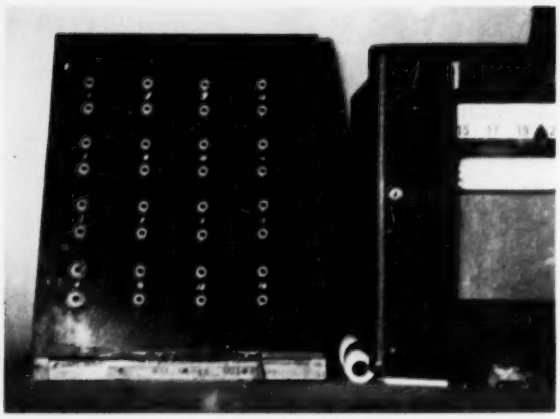


Fig. 5—Plug board for compensating lead connections permits use of 16 thermocouples with recorder at right.

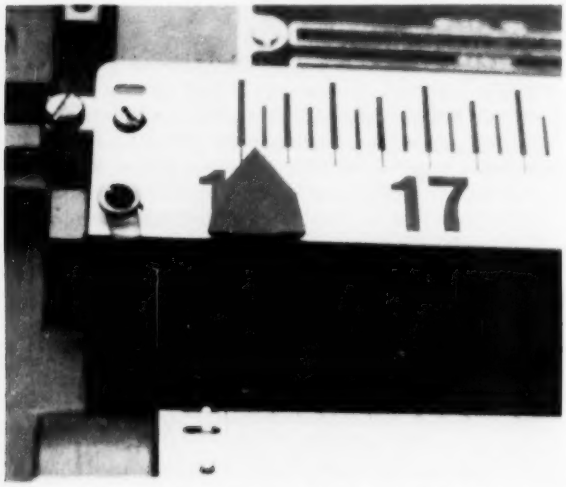


Fig. 6—Plastic lift devised at Naval Research Laboratory raises glass recorder pen when instrument stops.

are soldered directly to the jaw of the clip so that body of the clip does not enter electrically into the circuit. This type of connection was adopted after errors were traced to temperature gradients along the clips. Although the clips are only about an inch long they are usually located near the hot body and appreciable gradients can be developed.

The presence of the clips introduced, in effect, two more thermocouples into the system in the same manner as did the compensating leads attached to the Pt:Pt-Rh wires. Thus, in addition to the main Pt:Pt-Rh couple, four dissimilar couples are present; a Pt:Cu couple, a Pt-Rh:Cu couple, a Cu:Pt compensating lead wire couple, and a Cu:Pt-Rh compensating lead wire couple. If the temperatures at all four of the secondary junctions are identical, the resultant of the voltages generated will be zero, but if one temperature is different from the others, the secondary voltages will become unbalanced and erroneous temperatures will be recorded.

Soldering the connections in this fashion instead of using the screws also serves another purpose. Since the compensating lead wires do not function correctly at temperatures in excess of about 200 F the soft solder acts as a temperature fuse, melting and breaking the connection when the temperature in the compensating leads becomes sufficiently high to cause erroneous readings. It is to obtain this fusing action that soft low-melting-point solder rather than the more easily handled silver solder, which melts at a higher temperature, is used.

Mold gases escaping along the protection tubes often ignite at the top surface of the cope and the flame can melt the soldered joints. However, this difficulty may be eliminated by spreading a layer of clean, dry sand around the projecting ends of the tubes to a depth of about 1 in. The dry sand layer diffuses the gas over a wide area so that it is diluted to the point where it will not ignite.

A standard phone plug which fits into jacks at the recording instrument is attached to the opposite end of each compensating lead. The compensating leads and recording instruments are equipped with plugs and jacks of matching type so that all units are interchangeable.

Have Conventional Recording Instruments

The temperature recorders used at the Naval Research Laboratory are conventional, commercially available, automatic potentiometers with automatic cold junction compensators. For temperature measurements of molten metal in the ladle or furnace, round chart, single-point recorders (Fig. 4) are employed. Such recorders make an inked record of the temperatures and the pointer also indicates the instantaneous temperature on the large scale easily read from a distance.

Multiple-point, strip-chart instruments which permit temperatures to be recorded from 16 different thermocouples in approximately 15 second cycles are employed for measuring gradients in castings and their molds. The thermocouple stations in the instrument are linked to a jack board (Fig. 5) containing jacks for the thermocouple lead wires.

When it is desirable to use less than 16 couples in a single test, the unused points are tied in with jumper wires to other points which have couples attached and thus these stations record in their turn the temperature of the one thermocouple. When this is done, temperatures of each thermocouple are indicated on the chart at intervals shorter than 15 seconds. The accuracy of the recorders should be checked periodically with a portable precision potentiometer.

Refinement Added to Recorders

A refinement added to the recorders at the Naval Research Laboratory is a plastic lift (Fig. 6) which raises the glass recorder pen from the chart paper when the instrument operation is interrupted. When the pen remains in contact with the paper, the ink often continues to flow and forms blots which may cause the paper to tear when the instrument is restarted. This device is unnecessary, however, when sapphire tipped pens are used.

Details of a pyrometer used for the measurement of molten steel temperatures in ladles and induction furnaces are shown in Fig. 7. The pyrometer consists

essentially of two pieces of steel tubing joined at right angles through which are threaded the Pt:Pt-Rh thermocouple wires. The sealed quartz tube which protects the hot junction of the thermocouple is about 5 in. long, ¼ in. OD and ⅛ in. ID. This tube can be used for about 6 measurements in slag-free metal before it need be replaced; when slag is present it may last for only 1 or 2 tests. It is desirable therefore to make readings through a slag-free surface. This can be accomplished relatively easily in an induction furnace since the stirring action keeps the slag at the edges of the bath.

The two-hole alundum tubing which separates the thermocouple wires can be used indefinitely, replacement being necessary only in case of accidental breakage. The quartz tube is held in position by the spring clamping device shown in Fig. 7 which also permits quick and easy replacement of the tubing. A longitudinal segment of the lower end of the steel tubing is ground away to permit the spring to bear against the quartz tube.

The thermocouple wires extend thru the tubing from spools located at the junction box (Fig. 8). So, when the couple becomes contaminated or broken a new hot junction can be made with a minimum waste of wire by clipping off the old junction, unwinding the spool so that the desired length of wire is exposed, and then rewelding the ends. Each thermocouple can be used for approximately 50 readings before a new bead is necessary. The loose ends at the spools are connected to compensating lead wires running through the hollow handle of the pyrometer to a plug-in connection at the other end.

While the cost per inch of precious metal couples is about five times ($2.00 per linear foot) that of the ¼-in. OD quartz tubing (40 cents per linear foot), the greater frequency of replacement of the tube as compared to that of the couple bead is the controlling factor in computing the cost per temperature determination. The cost of the materials including wire, quartz and alundum is not over 10 cents per reading.

Since the furnaces at the Naval Research Laboratory are all induction melting units (the largest having a capacity of one ton) conditions are ideal for the measurement of furnace temperatures by means of immersion pyrometers. It is realized that temperature measurements in commercial electric and open hearth furnaces with their greater slag volumes and inaccessibility are more difficult to obtain and longer pyrometer holders and better thermocouple protection are required. The British[1, 2, 3, 4] have overcome these difficulties by incorporating graphite or refractory sleeves on the pyrometers to protect the assembly at the slag line and have developed pyrometer designs which permit the couple to extend thru furnace doors to the bath.

Such modifications of course increase the cost of obtaining temperatures but nevertheless the British Steel Founders' Association reports that in 1950 seventy per cent of British steel castings were produced in foundries employing Pt:Pt-Rh pyrometers for liquid steel temperature control. One foundry[5] operating electric and open hearth furnaces of 120 ton capacity reports a 60 per cent reduction in the frequency of skulled and hot heats since adopting immersion pyrometry as a means of controlling metal temperatures.

Solidifying Castings and Ingots

Immersion couples provide the only practical means for temperature determinations in solidifying castings and ingots. The primary source of error in the meas-

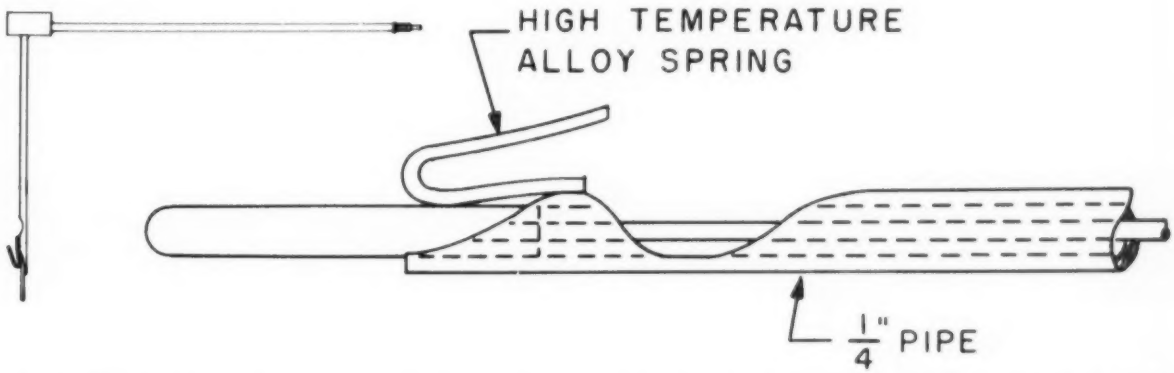


Fig. 7—Sketch of immersion pyrometer for furnace temperature measurements. Hot junction is at lower left, junction box at upper left. Detail drawing shows spring clamp for holding quartz protection tube in place.

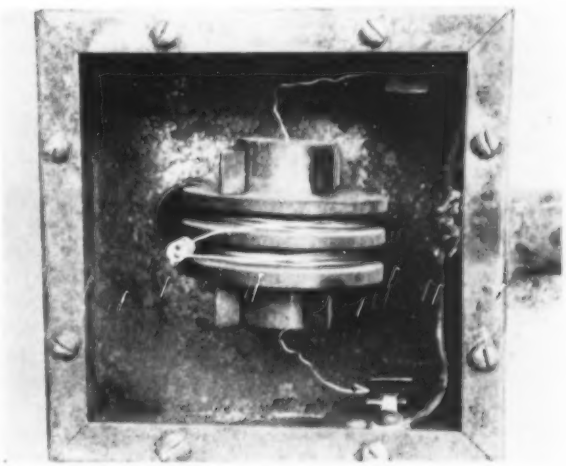


Fig. 8—Junction box with spool of thermocouple wire simplifies maintenance of hot junction.

Fig. 9—Bent quartz protection tubes used for measuring metal temperatures near the casting surface.

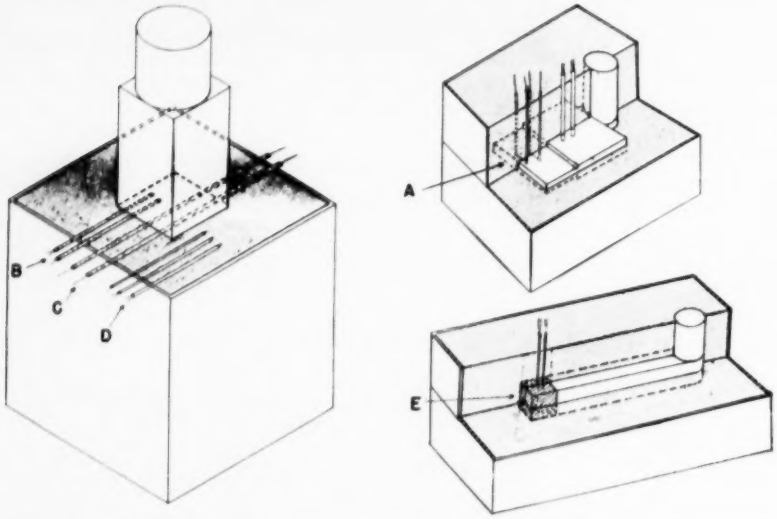


Fig. 10—Methods of locating thermocouples in castings near mold interface (upper right), in castings and in sand (left), and in chills (lower right). In mold at left, couples are located at a parting line to simplify molding.

urement of cooling cycles in solidifying metal is heat losses by conduction thru the thermocouple. It has been determined empirically that to avoid errors arising from this source, a segment of the couple equal to at least 8 times the diameter of its protection tube must be immersed in the solidifying metal.

Obviously, temperature measurements in thin castings or at near-interface locations in larger castings require immersion techniques other than the simple projection of the thermocouple into the mold cavity. In such cases the $\frac{1}{16}$-in. diameter protection tubes mentioned earlier can be used, either straight or bent into the shape of a square U (Fig. 9) positioned in the mold cavity parallel to a reference mold face as illustrated in Fig. 10,A. When the U-tube assembly is used, the bead is located at the center of the horizontal portion of the "U" and the depth of immersion is governed by the length of the horizontal member which lies along the isothermal plane under consideration. Unless precautions are taken to insure adequate immersion of the couple, the readings may be several hundred degrees low.

When measurements are desired in castings at points more than two inches from the mold-metal interface, satisfactory results can be obtained with the conventional type thermocouple assembly where the sealed protection tube containing both of the thermocouple wires and their insulating tubing is simply inserted to the desired instance into the mold cavity (Fig. 10,B). In molten steel this type of thermocouple assembly is not satisfactory for use at distances from the interface which are greater than 4 in. because the high temperatures involved cause the end of the quartz tube to soften sufficiently to be displaced by the buoyant force of the molten metal. This moves the hot junction of the thermocouple from its desired location and gives erroneous readings.

The $\frac{1}{4}$-in. and $\frac{3}{16}$-in. OD tubes can be used satisfactorily if the tube, open at both ends, is extended completely thru the casting so that the ends are anchored in he mold (Fig. 10,C). The thermocouple bead within the tubing is positioned at the desired location in the mold cavity with a thermocouple wire extending from each end of the tube. While this tube will bow slightly in the molten steel, the bead, will maintain very close alignment with the reference mold surface.

To determine the thermal cycles in the sand surrounding solidifying castings it is important, as in the case of metal temperatures, that a portion of the hot end of the thermocouple lie in a near-isothermal zone. This can be accomplished by extending the couple from the hot junction to the outside of the molding flask so that it lies parallel to the interface as illustrated in Fig. 10,D.

No Protection Is Required

No protection is required for thermocouples located in sand although it has been found desirable to enclose the wires in two-hole alundum tubing to prevent possible short circuiting. Such thermocouples are located by first ramming the mold to the level at which the temperature measurement is desired and then fixing the couples in position by means of staples after which the ramming process is continued. It is desirable that the couples be located near a parting line in order to minimize the possibility of shifting the couples from the desired locations. In a low conductivity material such as sand, the temperature gradients are extremely steep (as great as 2800 F per inch adjacent to solidifying steel) and a shift of only $\frac{1}{16}$ in. in the location of the thermocouple bead may result in an error of over a 100 F.

Locating the couples near a mold parting has the

added advantage of permitting the terminals of the couple to be brought out thru the flask without the necessity of drilling holes in the flask. Pt:Pt-Rh couples in most cases need be used only at locations in the sand which are within an inch of the solidifying steel. Sand is such a poor heat conductor that at distances greater than 1 in. from the casting temperatures do not exceed the safe operating temperatures of chromal-alumel couples.

Temperatures in ingot molds or chills can be measured by means of couples flash welded to the bottom of $\frac{3}{32}$-in. diameter holes which are drilled into the chills or ingots to the desired distance from the interface (Fig. 10,E). Rather than flash welding each wire separately into a drilled hole it is desirable that the thermocouple bead be formed prior to the welding operation. This assures intimate contact between the two wires and permits the hot junction to be more accurately located.

In measuring chill temperatures, it is not necessary to maintain a length of the hot end of the couple in an isothermal plane because the thermal conductivity values of the thermocouple and chill are relatively close. The only precaution required is that the two wires forming the couple be electrically insulated either by means of tubing or a coating of some refractory cement such as saureisen. As in the case of sand the necessity for using Pt:Pt-Rh couples for measuring chill temperatures is limited to regions expected to reach high temperatures. Except for very thin chills, chromel-alumel couples can usually be used at all locations since the high conductivities of the chills do not permit excessively high temperatures to develop near the interfaces.

References

1. "The Immersion Thermocouple," *Journal of Metals* (AIME), Mar. 1950, p. 468B.

2. *Seventh Report on the Heterogeneity of Steel Ingots*, British Iron and Steel Inst., p. 215.

3. *Eighth Report on the Heterogeneity of Steel Ingots*, British Iron and Steel Inst., p. 235.

4. "Third Report of the Liquid Steel Temperature Sub-Committee," *Journal of Iron and Steel Inst.*, vol. CLSV, no. 1, p. 213p (1942).

5. D. Manterfield, "Temperature Measurement of Liquid Steel," *Iron Age*, July 25, 1946, p. 52.

Four S & H & AP Convention Sessions

■ One session on air pollution problems in the foundry, two sessions on dust and ventilation control, and a fourth session on foundry safety will highlight the program of the Safety & Hygiene & Air Pollution Committee of A.F.S.

Three separate papers will be presented concerning air pollution, a subject first discussed broadly at an A.F.S. Convention in 1952. The papers comprise the introduction to the *Manual of Air Pollution Control* which a committee of the S & H & AP Program is now preparing.

The Dust and Ventilation Committee, which largely is concerned with interior rather than exterior working conditions, will sponsor two sessions on Wednesday, May 6. The morning session will report progress of the A.F.S. Program, and will present an important monograph on the growing problems of noise abatement in industry. The afternoon of May 6 will be devoted to a panel discussion on trends of dust control.

On Thursday, May 7, following a paper on the benefits from a safety program, an open question and answer panel discussion will be held. The committee has been engaged in recent months in presenting foundry safety training programs and in conducting seminars on safety and hygiene and air pollution at the Universities of Illinois and Wisconsin.

Convention sessions arranged by the Safety & Hygiene & Air Pollution Program committees are as follows:

TUESDAY, MAY 5

4:00-6:00 p.m.

"Future Air Pollution Prospects for the Foundry Industry," John M. Kane, American Air Filter Co., Louisville, Ky.

"Know your Problem for your Community," R. T. Griebling, Air Pollution Control Association, Pittsburgh.

"Air Pollution Control Equipment for the Foundry Industry," R. T. Pring, American Wheelabrator & Equipment Corp., Mishawaka, Ind.

WEDNESDAY, MAY 6

10:00 a.m.-12 noon

"Progress Report on A.F.S. Safety & Hygiene & Air Pollution Program," J. R. Allen, International Harvester Co., Chicago.

"Noise in the Foundry," H. T. Walworth, Lumberman's Mutual Casualty Co., Chicago.

4:00-6:00 p.m.

"Trends of Dust Control," K. J. Caplan, St. Louis.

Panel Discussion on Dust Control Trends: Panel Leaders—K. M. Smith, Caterpillar Tractor Co., Peoria, Ill., and A. G. Granath, National Engineering Co., Chicago.

THURSDAY, MAY 7

4:00-6:00 p.m.

"Positive Benefits of a Safety Program," F. W. Shipley, Caterpillar Tractor Co., Peoria, Ill.

Question and Answer Panel: A.F.S. Safety Committee. Discussion on foundry safety problems. Bring your plant safety problems and get an authoritative answer from experts.

Magnesium Alloy Characteristics

ALLOY RECOMMENDATION COMMITTEE
Light Metals Division
American Foundrymen's Society

■ The November 1951 issue of AMERICAN FOUNDRYMAN contained a series of tables listing the properties and characteristics of many of the aluminum casting alloys. These tables were prepared by the Alloy Recommendation Committee, Light Metals Division of the American Foundrymen's Society. These tables on aluminum alloys were published at that time in order to solicit comments and criticism of the values assigned to the various characteristics in order that general agreement could be reached among foundrymen regarding these values.

Develop Magnesium Data

This work has now been expanded to include the accompanying tables on magnesium alloys. These tables were originally developed to include only those alloys and tempers currently listed in ASTM specifications. It was then expanded to cover the magnesium-rare earth metal-zirconium and the magnesium-zinc-zirconium alloys because of the interest and use of them at this time. It is expected that specifications covering them will be accepted by ASTM this spring.

Table 1 in the accompanying data lists the alloys specified for sand castings, permanent mold castings, and die castings, using the ASTM alloy designations. It presents the chemical composition of the alloys and other specification numbers for alloys of similar composition.

The minimum and typical mechanical properties of these alloys are shown in Table 2. Listed here are the properties for the various tempers specified by ASTM or, in the case of the rare earth containing alloys, the tempers which will probably be approved this spring.

Table 3 presents information on both foundry characteristics and other important characteristics of the alloys. In this compilation you will note that a rating system has been used to describe many of these characteristics. This rating system lists the best alloy as number 1 and the higher numbers indicate a progressively worse condition for each particular characteristic. In the sand casting section a rating system of 1 to 3 was used but in the permanent mold and die casting sections a rating of 1 to 2 was used because of the small number of alloys specified in these sections. In addition, the rating system for sand castings is independent of the system for the same category in the permanent mold or die casting alloys. Thus, a rating of one in resistance to hot cracking may mean an entirely different level of resistance in a sand casting than it does in a die casting. The rating system is a comparative value only among the alloys in a given casting process. Since all of the alloys are in commercial use, a high number does not mean that the alloy is unsatisfactory for normal use.

Some of the physical properties are shown in Table 4 for these alloys.

Request Foundries to Express Views

It is recognized by the Committee that the various ratings and values shown in these tables may not be the same as would be assigned by different foundrymen. Individual experiences in various foundries will frequently indicate different values for many of the alloys. This information is published specifically to solicit these variations in values that have been obtained by the entire foundry industry. Information and criticism should be addressed to the American Foundrymen's Society, Attention: S. C. Massari, Technical Director, 616 S. Michigan Ave., Chicago 5, Ill.

As stated in the November 1951 issue of AMERICAN FOUNDRYMAN, these tables are not proposed as a replacement for the normally recommended cooperation between casting designers and foundrymen. A designer will still benefit through discussion of his casting design and requirements with the ultimate producer before establishing final design and alloy requirements.

TABLE 1—ALLOY COMPOSITION AND SPECIFICATIONS FOR MAGNESIUM ALLOYS SAND CASTING . . . PERMANENT MOLD CASTING . . . DIE CASTING

ASTM Alloy Specification	Nominal Composition, % (a)					Similar Specifications for Comparative Purposes		
Sand Casting Alloys-B80-51T	Al	Zn	RE(d)	Zr	Mn	Federal	SAE	AMS (b)
AZ63A	6.0	3.0			0.15 Min.	QQ-M-56	50	4420
AZ92A	9.0	2.0			0.15 "	QQ-M-56	500	4434
AZ91C	8.7	0.7			0.13 "	QQ-M-56		
AM80A	8.5				0.15 "			
AM100A	10.0				0.10 "			
M1B					1.20 "	QQ-M-56		
EK30A (c)			3.0	0.2 Min.				
EK41A (c)			4.0	0.7				
EZ33A (c)		3.0	3.0	0.75				
ZK51A (c)		4.6		0.75				
ZK61A (c)		6.0		0.80				
Permanent Mold Alloys-B199-51T								
AZ92A	9.0	2.0			0.10	QQ-M-55	503	4484
AM100A	10.0				0.10	QQ-M-55	502	
Die Casting Alloys-B94-49T								
AZ91A	9.0	0.7			0.13	QQ-M-38	501	4490
AZ91B	9.0	0.7			0.13		501A	
AS100A	10.0				0.10			

(a) For specific compositions refer to applicable specifications.
(b) Aeronautical Materials Specifications.
(c) These alloys are listed at this time in anticipation of their acceptance at the 1953 ASTM meeting.
(d) RE stands for total rare earth metal content - usually signifying mischmetal content.

TABLE 2—MECHANICAL PROPERTIES OF MAGNESIUM CASTING ALLOYS SEPARATELY CAST TEST BARS

ASTM Alloy Specification	Condition or Temper	Specified Minimum Properties			Typical Properties					
		Yield Strength psi	Tensile Strength psi	Elong. % in 2 In.	Yield Strength psi	Tensile Strength psi	Elong. % in 2 In.	Brinell Hardness 500Kg-10mm	Shear Strength psi	Endurance Limit, psi 10^8 cycles (b)
Sand Casting Alloys-B80-51T										
AZ63A	F	Not Req.	24,000	4	12,000	28,000	6	50	18,000	11,000
	T4	Not Req.	34,000	7	14,000	40,000	14	54	18,000	13,000
	T5	11,000	24,000	2	15,000	29,000	4	55		11,000
	T6	16,000	34,000	3	19,000	40,000	5	72	20,000	12,000
AZ92A	F	Not Req.	20,000	Not Req.	14,000	24,000	2	65	18,000	12,000
	T4	Not Req.	34,000	6	15,000	40,000	10	63	20,000	14,000
	T5	11,000	20,000	Not Req.	17,000	25,000	1	80	19,000	11,000
	T6	18,000	34,000	1	22,000	40,000	2	86	22,000	12,000
AZ91C	F	Not Req.	18,000	4	14,000	24,000	2	60		
	T4	Not Req.	34,000	7	14,000	40,000	14	55		12,000
	T6	16,000	34,000	3	19,000	40,000	5	70	20,000	12,000
AM80A	F	Not Req.	23,000	3	14,000	29,000	6	46		
	T4	Not Req.	34,000	7	11,000	38,000	12	48	18,000	7,500
	T6	12,000	34,000	4	15,000	38,000	9			
AM100A	T6	17,000	34,000	Not Req.	22,000	40,000	1	70	22,000	10,000
M1B	F	Not Req.	12,000	3	4,500	14,000	5	33	11,000	
EK30A(a)	T6	14,000	18,000	1	16,000	21,000	2	45		8,000
EK41A(a)	T5	14,000	20,000	Not Req.	16,000	23,000	1	50		8,000
	T6	16,000	22,000	1	18,000	25,000	2	50		10,000
EZ33A(a)	T5	14,000	18,000	1	16,000	21,000	2	50		10,000
ZK51A(a)	T5	20,000	34,000	5	26,000	41,000	8	65	22,000	9,000
ZK61A(a)	T6	25,000	40,000	5	28,000	45,000	10			
Permanent Mold Alloys-B199-51T										
AZ92A	F	Not Req.	20,000	Not Req.	14,000	24,000	2	65	18,000	12,000
	T4	Not Req.	34,000	6	15,000	40,000	10	63	20,000	14,000
	T5	11,000	20,000	Not Req.	17,000	25,000	1	80	19,000	11,000
	T6	18,000	34,000	Not Req.	22,000	40,000	2	86	22,000	12,000
AM100A	F	Not Req.	20,000	Not Req.	12,000	22,000	2	53	18,000	10,000
	T4	Not Req.	34,000	6	13,000	40,000	10	52	20,000	11,000
	T6	15,000	34,000	2	16,000	40,000	4	60	21,000	10,000
	T61	17,000	34,000	Not Req.	22,000	40,000	4	70	22,000	10,000
Die Casting Alloys-B94-49T										
AZ91A	F	Not Req.	Not Req.	Not Req.	22,000	33,000	3	60	20,000	14,000
AZ91B	F	"	"	"	22,000	33,000	3	60		
AS100A	F	"	"	"	22,000	33,000	2			

(a) These alloys are listed at this time in anticipation of their acceptance at the 1953 ASTM meeting.

(b) R. R. Moore endurance test.

TABLE 3—OUTSTANDING CHARACTERISTICS OF MAGNESIUM CASTING ALLOYS

ASTM Alloy Specification	Pattern Shrinkage Allowance In/Ft. (i)	Approx. Melting Range °F Solidus (l)	Liquidus	Foundry Characteristics: Resistance to Hot Cracking (a)	Pressure Tightness	Fluidity (b)	Microporosity Tendency (c)	Normally Heat Treated	Other Characteristics: Resistance to Corrosion (d)	Machining (e)	Electroplating (k)	Surface Treatment (f)	Suitability to Brazing (g)	Suitability to Welding (h)
Sand Casting Alloys-B80-51T														
AZ63A	5/32	685	1130	2	3	1	3	Yes	2	1	1	1	No	3
AZ92A	5/32	770	1100	2	2	1	2	Yes	2	1	2	2	No	2
AZ91C	5/32	795	1105	2	2	1	2	Yes	2	1	2	2	No	2
AM80A	5/32	810	1125	1	2	1	2	Yes	3	1	2	2	No	1
AM100A	5/32	810	1100	1	2	1	2	Yes	3	1	2	2	No	1
M1B	5/32	1198	1200	3	1	2	1	No	1	1	2	1	Yes	1
EK30A(m)	7/32	1100	-	3	1	2	1	Yes	1	1	2	1	No	1
EK41A (m)	7/32	1095	-	3	1	2	1	Yes	1	1	2	1	No	1
EZ33A(m)	3/16	1010	-	3	1	2	1	Yes	2	1	2	1	No	1
ZK51A(m)	5/32	950	approx.	(j)	2	2	(j)	Yes	1	1	2	1	No	3
ZK61A(m)	5/32	950	approx.	(j)	2	2	(j)	Yes	1	1	2	1	No	3
Permanent Mold Alloys-B199-51T														
AZ92A		770	1100	2	2	1	2	Yes	1	1	1	1	No	2
AM100A		810	1100	1	1	1	1	Yes	2	1	1	1	No	1
Die Casting Alloys-B94-49T														
AZ91A		795	1105	2	1	2	1	No	1	1	1	1	No	No
AZ91B		795	1105	2	1	2	1	No	1	1	1	1	No	No
AS100A				1	1	1	1	No	2	1	1	1	No	No

Notes: (See text for discussion of ratings. 1 indicates best of group, 3 indicates poorest of group.)

(a) Ability of alloy to withstand contraction stresses while cooling through hot-short or brittle temperature range.

(b) Ability of liquid alloy to flow readily in mold and fill thin sections.

(c) Based on radiographic evidence.

(d) Based on 14 day test in 3% NaCl solution, alternate immersion.

(e) Composite rating based on ease of cutting, chip characteristics, quality of finish and tool life. Ratings, in the case of heat-treatable alloys, based on -T6 type temper. Other tempers, particularly the annealed temper, may have lower rating.

(f) Ability of castings to be cleaned in standard pickle solutions and to be conditioned for best paint adhesion.

(g) Refers to suitability of alloy to withstand brazing temperature without excessive distortion or melting.

(h) Based on ability of material to be fusion-welded with filler rod of same alloy.

(i) Allowance for average castings. Shrinkage requirements will vary with intricacy of design and dimensions.

(j) Inexperience with these alloys under wide production conditions make it undesirable to supply ratings at this time.

(k) Ability of casting to take and hold an electroplate applied by present standard methods.

(l) As measured on metal solidified under normal casting conditions.

(m) These alloys are listed at this time in anticipation of their acceptance at the 1953 ASTM meeting.

TABLE 4—PHYSICAL PROPERTIES OF MAGNESIUM CASTING ALLOYS

ASTM Alloy Specification	Condition or Temper	Spc Gr 75 F	Density lb/cu in.	Thermal Conductivity at 212-570 F CGS Units	Coefficient of Thermal Expansion per °F x 10^{-6} 68 - 212 F	Electrical Conductivity % IACS
Sand Casting Alloys-B80-51T						
AZ63A	F	1.84	0.067	0.18	14.5	15
	T4					12
	T6					14
AZ92A	F	1.82	0.066	0.17	14.5	12
	T4					11
	T6					12
AZ91C	F	1.81	0.066	0.16	14.5	10
AM80A	T4	1.80	0.065	0.18	14.5	12
AM100A	F	1.81	0.066	0.17	14.5	12
	T4					10
	T6					12
M1B	F	1.76	0.064	0.30	14.5	28
EK30A(a)	T6	1.79	0.065		14.5	29
EK41A(a)	T6	1.81	0.066		14.5	25
EZ33A(a)	T5	1.84	0.067		14.5	26
ZK51A(a)	T5	1.83	0.066		14.5	29
ZK61A(a)	T6	1.83	0.066		14.5	-
Permanent Mold Alloys-B199-51T						
AZ92A	F	1.82	0.066	0.17	14.5	12
	T4					11
	T6					12
AM100A	F	1.81	0.066	0.17	14.5	12
	T4					10
	T6					12
Die Casting Alloys-B94-49T						
AZ91A	F	1.81	0.066	0.17	14.5	10
AZ91B	F	1.81	0.066	0.17	14.5	10
AS100A	F	1.81	0.066	0.17	14.5	10

(a) These alloys are listed at this time in anticipation of their acceptance at the 1953 ASTM meeting.

Off-floor Maintenance Workers
Need Safe Scaffolds

For years, accidents involved in interior off-floor maintenance have resulted largely from carelessness and use of makeshift apparatus for getting at maintenance points. These makeshifts include unsuitable or wobbly ladders, makeshift scaffolding, packing cases, and so on. E. J. Clary, New York, outlines steps which foundries can take to reduce accidents and to cut the cost of foundry building maintenance.

■ A study of building maintenance in any foundry property (as against maintenance of machinery and equipment) will find the chief accident hazards result in performing the following routine functions: (1) cleaning windows, interior glass; (2) lighting maintenance; (3) walls; (4) general cleaning; (5) painting; (6) sign and marker work (interior); and (7) property repair work, minor improvements.

All of these functions are involved in the proper conditioning of almost every foundry building and half of them subject maintenance operatives to accidents minor or otherwise. All of these accidents are costly to management and to the injured foundry worker.

Out of every 100 building maintenance accidents, 75 are the direct result of makeshift scaffolding, or scaffolding that fails to protect the maintenance worker —often in spite of carefulness. The balance are due primarily to carelessness on the part of the worker. Such as:

1. TAKING UNSAFE POSITIONS.
   - Standing under scaffolds on which men were working or which were being torn down.
   - Standing on overhanging boards.
   - Improper stance when using leverage tools.
   - Shortcutting, climbing up or down, without using ladders.
   - Over-reaching.
2. UNSAFE MOVEMENTS.
   - Stepping without looking (except backwards).
   - Stepping backward without looking.
   - Climbing without looking.
3. OVERLOADING.

Besides the safety factor, and the effects of the accident rate in the foundry safety program, management must also consider this whole scaffolding problem from the standpoint of maintenance cost. Not only do maintenance accidents result in time loss but inadequate rules and methods governing company property maintenance program slow up the work and increase its cost. Much of this increased cost is the result of using makeshift apparatus in getting at maintenance points, according to safety engineers, who also say that the matter of proper interior scaffolding has been much neglected both by superintendents and even by employers themselves.

Management is well aware of the steadily rising costs of off-floor building maintenance (as against maintenance of machinery production and equipment) due largely to the size of modern foundry buildings, better construction, modern touches that need more care, and the rising cost of maintenance labor. The matter of modern lighting alone (especially fluorescent lighting) makes great inroads on the maintenance budget, although the result in better lighting largely offsets this rise.

Solution to the problem of off-floor maintenance accidents lies in following recommendations of the National Safety Council (bulletin No. 1 on ladders and No. 12 on scaffolds) and taking advantage of available scaffolding units.

As pointed out by the Council: "There is no such thing as a temporary scaffold; a scaffold may be erected for temporary use, but if a scaffold is needed at all, the scaffold must be built properly and fastened securely.

Scaffold built up of standard units avoids maintenance worker accidents which result from makeshift supports.

Shop talk

Practical questions and answers

Build Own Rotary Furnace

We are making whiteheart malleable for agricultural castings but want to change to blackheart. Accordingly, we built an oil-fired, rotary furnace with a melting capacity of 8,000-9,000 lb. A steel recuperator heats the air to 930 F; nevertheless, we are having trouble with low temperatures.

Experience of foundries in this country indicates that the rotary furnace is not particularly satisfactory for melting malleable iron. At least one large foundry has stopped using this melting unit.

The difficulties encountered are due to the heavy slag which normally covers the metal, making it difficult to control the stability of the iron carbide through atmosphere control. Excessive amounts of primary graphite occur in the castings, resulting in reduced mechanical properties. Succeeding charges of metal evidently do not mix longitudinal, but tend to remain segregated, making composition control difficult.

Your low metal temperature is probably due to the insulating effect of the slag blanket. Melting and superheating time should be approximately five hours, using an oxidizing flame.

Faces Phosphorus Problem

Specifications of some of our customers stipulate a maximum phosphorus content of 0.15 or 0.20 per cent. We have encountered trouble buying pig with less than 0.28 per cent phosphorus. What would be the effect of, say, 0.40 per cent phosphorus on a casting supposed to contain half that much? Does phosphorus tend to segregate? Our laboratory reports phosphorus as high as 0.43 per cent but our foundry feels that is actually only about 0.30 per cent.

You can dilute your cupola charge with steel (phosphorus about 0.05 per cent) to offset the effects of high phosphorus pig and scrap. Phosphorus does not materially affect tensile and transverse strength of iron until it reaches about 0.30 per cent and even then the effect is only a gradual reduction. However, phosphorus tends to reduce machinability quite markedly in some irons. Machining, and scraping as on ways of machine tools, can be seriously reduced even when the matrix of the iron is essentially soft because of the formation of steadite, a hard brittle microconstituent containing about 10 per cent phosphorus.

The low melting point of steadite (about 1750-1800F) accounts for its tendency to segregate in the last areas of a casting to solidify. Accordingly, if a sample taken for analysis is not representative of the casting as a whole or of some critical section, it is quite possible for the composition to run higher than average in phosphorus.

Casting Tolerances

Our Engineering Department wants to establish some standards for design work to cover reasonable limits which we might expect our foundry to maintain for so-called "foundry fit." Are any standards available?

Since variations in casting designs and the molding method have considerable influence on dimensional variations in castings, it is difficult to set universal standards. Most satisfactory results are obtained when close cooperation exists between designer, patternmaker, and foundryman.

In the case of gray iron, in which you are interested, dimensional tolerances can be held—under carefully controlled conditions—to the following:

Dimension	As-Cast Tolerance
2 in.	± 0.010
4	± 0.020
6	± 0.030
8	± 0.040
10	± 0.050
12	± 0.060

In some instances, one or two dimensions of a casting will be critical and it frequently will be possible to hold those within closer tolerances than normal.

Concerning Specifications

In preparing specifications, we are wondering whether inoculation should be a requirement and if so whether a specific inoculation process should be required. We are also wondering about the advisability of specifying an aging process.

Whether or not the producing foundryman uses inoculants should be left to his discretion. To specify that the casting should be made from an inoculated iron in itself will not necessarily insure that the casting will be acceptable, since inoculation is effective primarily only when the iron has a properly balanced chemical composition. In addition, the same end result can often be achieved by other methods.

If specific castings must possess dimensional stability, then the specification should include a provision for stress relief heat treatment. This normally should be conducted by heating the castings to a temperature not to exceed 1,000 F, holding them at this temperature for sufficient time to insure that all sections have attained uniform temperature (rule of thumb says an hour for each inch of section thickness), then cooling slowly. Such a heat treatment will relieve internal stresses without materially detracting from the as-cast mechanical properties.

For an interesting recent discussion of relief of residual stresses in cast iron read *"Elements in the Cause and Cure of Residual Stresses in Cast Iron"* by L. A. Aldinger, General Motors Corp., Detroit, (page 77, March issue of American Foundryman).

Sand for Ornamental Castings

We cast and finish ornamental nonferrous work running from ten to 100 lb and sometimes as high as 300-400 lb. Perfect surface finish is essential; we will appreciate advice on how to get it.

Naturally bonded, fine-grained sands are popular for ornamental fittings, memorial tablets, name plates, and architectural castings. Only recently has the trend been toward semi-synthetic sands.

Fundamentally, non-ferrous foundries have been taught to use a finer,

siltier-feeling sand containing its own bond. This is more hereditary than practical. If you have good mulling equipment and proper sand control, a semi-synthetic mixture which can be controlled and give good casting quality at all times is recommended. If you do not have mixing equipment, then you must depend upon naturally bonded sand.

If you are mechanized to any degree, sands such as the fine grades of Albany, No. 00-No. 1, or its equivalent, the fine grades of Tennessee molding sand are recommended.

A good semi-synthetic mixture for memorial work can be made from:

25 lb	Naturally bonded sand, A.F.S. Fineness Number about 250, clay content approximately 12 per cent or less.
75 lb	Bank or silica sand, fineness 90 to 140, clay less than 1 per cent.
1 lb	Western bentonite
1 lb	Southern bentonite
5-6 pints	Water

This mixture may show a permeability of no more than 10, green compression strength of 6-8 psi, and dry strength of about 20 psi. These properties are obtained with a mold hardness of approximately 70, which is important for flat plates. About one per cent wood flour is good insurance against expansion defects on tablets and plates.

To guarantee a good surface, use a wash of seven parts by weight of graphite added to one part lacquer and 12 parts alcohol or gasoline. Good washes are also commercially available. The wash is sprayed on the green sand molds and ignited. This practice can be hazardous and should be carried out cautiously.—CLYDE A. SANDERS, *vice-president*, American Colloid Company, Chicago.

Needs Skull Cracker

We are interested in securing equipment for processing gray iron scrap prior to charging in the cupola. What do you recommend?

For heavy scrap many foundries use a heavy ball raised by crane or electromagnet and dropped onto the scrap to be broken. For protection of personnel and equipment, a suitable barrier should be provided as protection against flying scrap.

For borings and turnings, a number of foundries use briquetting presses which are available on the market. Melting of briquets is advantageous where a large supply of turnings of known analysis is available. After briquetting, the short cylindrical slugs of compressed metal have about 90 per cent of the density of solid iron and can be handled and stored like any scrap.

A British firm has developed an air-operated ram for injecting loose turnings through the side of the cupola at approximately the top of the melting zone.

Sand Reclamation

We have recently developed a machine for scouring and cleaning solid particles and are investigating the possibility of using the equipment for reclamation of foundry sands. Helpful suggestions will be appreciated.

Various types of sand reclamation equipment have been developed by the manufacturers who customarily serve the foundry industry and by various foundrymen. In general, the methods can be classified as thermal, hydraulic, or pneumatic depending upon the principle on which binder removal is based.

All types of equipment, their operating costs and characteristics, advantages and disadvantages, and preferred applications will be covered in the Sand Reclamation Symposium being held during the 1953 A.F.S. Annual Convention. The Symposium, consisting of six papers, is scheduled for the morning and afternoon of Wednesday, May 6. Symposium papers will be issued during the latter part of 1953 as a special publication.

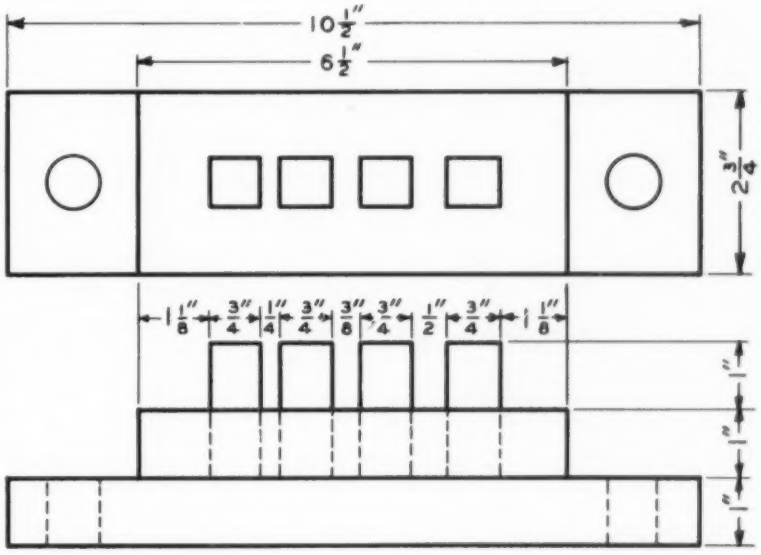
Now, There's an Idea!

Practical ideas, developed and proved in foundries and pattern shops, are presented in this column. *Now, there's an idea!* helps American Foundryman readers promote the exchange of ideas, the motivating force behind the American Foundrymen's Society. Contributions for publication are solicited. They may be of any length, preferably short, preferably illustrated by photo or sketch.

■ The old type rod bending device—a flat piece of steel with holes drilled at intervals and of varying sizes to accommodate different rod sizes—was difficult to use. Rods were bent by inserting them in the proper hole to the point where they were to be bent and then bending them. Inserting and withdrawing the rods wore the holes, making it difficult to keep the rod from twisting. In addition, it was often difficult to withdraw a rod after bending it into a complex shape.

Joseph A. Chervy, Worthington Corp., Harrison, N. J., devised a simple, inexpensive jig for bending core rods and reported it at a Shop Kinks session of the Metropolitan Chapter of A.F.S. His drawing shows how to do the job. The body of the device can be made in either one of two parts, he says. If made in one piece, the two ends can be milled; if two, the sections can be welded.

Holes are drilled in both ends of the rod bender so it can be mounted in either a horizontal or a vertical position. Distance between the ¾-in. broached holes which receive the plugs is the same as the diameter of the rod to be bent. Number of plugs is optional and will be governed by the needs of the particular foundry. Plugs are removable and, as they wear, can be turned so that all four sides eventually are used. Wear on the edges of the plugs is slow and after four years of use it appears they will last a lifetime.



Non-Ferrous Founders' Society Observes Tenth Anniversary

In April, the Non-Ferrous Founders' Society celebrates the tenth anniversary of its founding as an active organization that has made brass, bronze and aluminum foundrymen industry-conscious, and has materially aided the solidarity of the foundry industry as a whole.

The society was organized at St. Louis on April 28, 1943, during the annual A.F.S. Foundry Congress of that year. Recognizing the need for a cooperative group that could give business management an articulate voice in the non-ferrous field, A.F.S. assisted in arranging a series of meetings that resulted in the formation of the first organization of non-ferrous foundrymen ever successfully attempted.

The purpose of the society, as stated in its by-laws, is "To make available to the U.S. Government in time of need the facilities of the Non-Ferrous Foundry Industry and to provide a means for liaison between this industry and the government on any matters of mutual interest," and "To collect and disseminate statistics . . . and to give proper consideration and expression of opinion upon questions affecting the industry or public interest . . ."

L. H. Durdin is the current president of the Non-Ferrous Founders' Society.

That NFFS has carried out its objectives and rendered a valuable service to the industry in times of emergency is shown by the steady growth of company membership from the original 66 in 1943 to well over 400 at the present time. Today, the membership of the group includes a representative cross-section of the non-ferrous foundry industry.

Non-Technical in Scope

The society is basically non-technical in scope, and is essentially a business-management type of organization. Among its major activities are government liaison in Washington and elsewhere, production of analytical cost studies applicable to non-ferrous casting operations, labor relations and ethics of foundry operations.

NFFS functions from its Chicago national headquarters through 20 districts, each of which elects a director for a three year term. Twelve chapters have been organized to date, meeting at varying intervals. At these sessions, in addition to society business, periodic cost clinics are conducted for management groups, using accounting cost manuals published by the Society.

The Non-Ferrous Founders' Society has provided valuable service in Washington for its members in the formulation of pricing orders through NPA, and was active in development of the first decontrol order under the present administration. Recently, as the result of almost a decade of work, agreements were concluded with the National Association of Purchasing Agents on sales terms and conditions of sales, as affecting the non-ferrous field. In addition, certain collaborative work has been done with the armed forces, and management members have been kept advised on labor rates and fringe issues.

Present officers of the society are: L. H. Durdin, president; Robert Langsenkamp, vice-president; Arthur Fischer, 2nd vice-president; and James W. Wolfe, secretary-treasurer.

NFFS will hold its Tenth Anniversary dinner in Chicago on May 4, opening day of the 1953 A.F.S. Convention. At that time, recognition will be accorded the organization's past presidents, including Chester K. Faunt, Chicago (1943); Roy M. Jacobs, Milwaukee (1944); Edwin W. Horlebein, Baltimore (1945); William A. Gluntz, Cleveland (1947); Fred Haack, Jr., Chicago (1948); Walter M. Clark, Boston (1949); and J. D. Zaiser (1950). Thomas S. Hemenway, who served as society president in 1946 and 1947, is deceased.

American Foundrymen's Society salutes the Non-Ferrous Founders' Society on the occasion of its first decade of service to the industry. As a charter member of the National Castings Council, comprising the ten major associations of the metal castings industry, NFFS completes the solid front presented by the industry on problems affecting all foundrymen.

FEF Reviews New Educational Techniques

■ Over 130 foundrymen, educators and engineering school students gathered at the Hotel Cleveland, Cleveland, March 11-12 for the annual technical-university-industry advisory committee conference of the Foundry Educational Foundation. The event marked also the annual meeting of the Foundation, which saw James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., elected president, succeeding Marion J. Allen, American Steel Foundries, Chicago, who was named chairman of the board.

Thomas Kaveny, Jr., Herman Pneumatic Machine Co., Pittsburgh, was elected vice-president of FEF, and two new trustees-at-large were designated: Herman P. Good, Textile Machine Works, Reading, Pa., and J. T. McIntyre, Sibley Machine & Foundry Corp., South Bend, Ind.

Trustees representing the founding members of FEF for the coming year are: Malleable Founders' Society—W. H. Moriarty, National Malleable & Steel Castings Co., Cleveland, and Ralph T. Rycroft, Kencroft Malleable Co., Buffalo, N.Y.; Gray Iron Founders' Society—Thomas I. Curtin, Jr., Waltham Foundry Co., Waltham, Mass., and W. R. Tanner, Zenith Foundry Co., West Allis, Wis.; American Foundrymen's Society—Walter L. Seelbach, Superior Foundry, Inc., Cleveland, and H. Gordon Robertson, American Steel Foundries, Alliance, Ohio.

Foundry Equipment Manufacturers' Association—Thomas Kaveny, Jr., and Kennard F. Lange, Link-Belt Co., Chicago; Non-Ferrous Founders' Society—H. A. White, Smeeth-Harwood Co., Chicago, and Thomas B. Belfield, Cochrane Foundry Co., York, Pa.; Steel Founders' Society—Marion J. Allen, and Luther A. Kleber, General Steel Castings Corp., Granite City, Ill.

Continuing trustees-at-large are: James H. Smith, Central Foundry Div., General Motors Corp., Saginaw, Mich.; E. Claude Jeter, Foundry Div., Ford Motor Co., Cleveland; Anthony J. Haswell, Dayton Malleable Iron Co., Dayton, Ohio; John A. Wagner, Wagner Malleable Iron Co., Decatur, Ill.; James T. MacKenzie; E. C. Hoenicke, Foundry Div., Eaton Mfg. Co.; Leon J. Wise, Chicago Malleable Castings Co., Chicago; R. P. Brewer, Symington-Gould Corp., Depew, N.Y.; R. L. Gilmore, Superior Steel & Malleable Castings Co., Benton Harbor, Mich.; and A. M. Slichter, Pelton Steel Castings Co., Milwaukee.

Retiring President Allen presided at the morning session March 11, and stated that while the principles of education for foundry careers have now been established, more coaching of the industry is needed. He suggested greater development of the cooperative education plan, greater standardization of scholarship amounts, and a seminar on teaching techniques as part of a long-range program.

Dreher Leaves Foundation

Mr. Allen then announced the resignation of G. K. Dreher, executive director of the Foundation since its inception, effective May 1, to return to industry as foundry manager of Waukesha Foundry Co., Waukesha, Wis. In recognition of his service to the industry, Mr. Dreher has been named assistant secretary-treasurer of the Foundation. Announcement also was made that E. J. Walsh, executive secretary of National Foundry Association, Chicago, was elected to succeed Mr. Dreher as executive director of FEF.

First speaker at the opening session

Dinner table companions at the FEF conference held in Cleveland were, counterclockwise: A.F.S. Past President F. J. Walls, International Nickel Co., Detroit; A.F.S. President I. R. Wagner, Electric Steel Casting Co., Indianapolis; Max Ganzauge, General Railway Signal Co., Rochester, N. Y.; Mrs. W. L. Seelbach; A.F.S. Secretary Wm. W. Maloney; E. C. Hoenicke, Eaton Manufacturing Co., Detroit, A.F.S. director-nominee; A.F.S. Past President Walter L. Seelbach, Superior Foundry, Inc., Cleveland; Mrs. W. G. Gude; and W. G. Gude, Penton Publishing Co., Cleveland.

was F. G. Steinebach, *Foundry*, Cleveland, on *"Present and Future of Cast Metals."* The speaker traced major foundry developments of the past 50 years and referred to the recent Paley report predicting an increase of 62 per cent in cast metals in the next 75 years. He urged that more attention be given to informing young engineers that the foundry industry is ready and willing to accept new ideas, and that metal casting offers tremendous possibilities for progressive thinking.

Four prominent foundrymen contributed to a panel on *"The Use of Engineering Talent."* C. K. Briggs, Steel Founders' Society of America, Cleveland, told how foundries can best use the knowledge of *"The Metallurgical Engineer,"* in connection with raw materials, specifications, quality control, design, analyses, testing, inspection, welding and other processes. B. C. Yearley, National Malleable & Steel Castings Co., Chicago, in discussing *"The Mechanical Engineer,"* said that the old-time foundry artisan had to make up in personal experience for engineering deficiencies of his times, with the accent on "how," not "why." By achieving many startling reductions in man-hours per ton of castings and streamlining the handling of materials, the speaker said, the foundry engineer has established his value, but many problems still remain, such as the use of nails in steel castings and greater knowledge of molding sands.

W. S. Williams, Lynchburg Foundry Co., Lynchburg, Va., stated that most foundries still do not know how best to employ the knowledge of *"The Industrial Engineer,"* who in general is concerned with the use of materials and those who use them, rather than with the materials themselves. He described successful applications of industrial engineering in his company, such as work places, departmental shifts, materials handling, shipping methods and production job estimates. Final morning speaker, E. N. Baldwin, Westinghouse Corp., Wilkinsburg, Pa., presented a detailed description of engineering positions in industry, with particular reference to foundry work.

Wednesday afternoon's session chairman, Thomas Kaveny, Jr., Herman Pneumatic Machine Co., Pittsburgh, led the panel on *"Recruiting and Training of Engineers."* Dean Eric Walker, Pennsylvania State College, State College, Pa., struck the keynote with a reminder of the underlying reasons for acquiring an engineering education, stressing the value of engineering fundamentals in any industrial career. F. Lynn Cason, Purdue University, Lafayette, Ind., offered valuable hints to foundrymen on the recruiting of graduating engineers, pointing out the competition that exists today for engineering talent of all kinds.

A sound and carefully supervised in-plant training program for the first five years of a young engineer's industrial life was urged by Karl McEachron, General Electric Co., Erie, Pa. In a talk, *"A Small Foundry Hired Me,"* R. W. Lundberg, Gibson & Kirk Co., Baltimore, Md., stated that a small foundry offers many opportunities to a young engineer, and that the attitude of management is important to his success. Responsibility, he said, is there for the taking, if he shows at the outset that he's there to help and not to "run the show." Concluding the first day, G. K. Dreher presented a series of slide films on principles of education for use by the foundry industry. He offered the series as an answer to the search for a means of bringing the program of FEF closer to practical foundrymen.

The annual TAC-UAC dinner was served Wednesday evening, the after-dinner program being introduced by new FEF President MacKenzie, who introduced Anthony Haswell, Dayton Malleable Iron Co., Dayton, Ohio, one of the original sponsors, in paying tribute to the services of George Draher. Mr. Haswell said that the Foundation and Mr. Dreher had been almost inseparably linked in the development of the industry's new understanding of engineering principles. A handsome set of matched luggage was presented to Mr. and Mrs. Dreher by the FEF staff—Charles Esgar, Mrs. Hazel Patterson and Frank Graviglia—as a farewell gift.

Retiring FEF President Marion Allen, American Steel Foundries, Chicago (left), congratulates incoming president, A.F.S. National Director James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala. At right is Thomas Kaveny, Jr., Herman Pneumatic Machine Co., Pittsburgh, new FEF vice-president. Second from left is George K. Dreher, who resigns May 1 as executive director of the Foundation to return to industry as foundry manager of Waukesha Foundry Co., Waukesha, Wis.

What an Engineer Is

The speaker of the evening, J. Elliott Janney of Rohrer, Hibler & Replogle, Cleveland, discussed the *"Use and Abuse of Discipline,"* a result of job analyses on the fitness of individuals for certain responsibilities. "Engineers," he said, "in general can be expected to be mentally alert, numbers minded, meticulous, more methods than problem minded, better at handling tangibles, more logical and analytical than persuasive and understanding, more introvertive, and high in perceiving spatial relations."

A panel on *"University Activity"* in foundry work formed the Thursday morning session, with Mr. Dreher as chairman and faculty members of FEF schools presenting many interesting developments. Prof. Warren C. Jeffery, University of Alabama, described a practical foundry problem worked out at the school. Prof. C. C. Sigerfoos, Michigan State College, discussed a series of field problems carried on to provide greater familiarity with practical foundry operations.

Demonstrations in wax of hot spots, temperature gradients, gating and shrinks were described by David Ekey, Pennsylvania State College, as used in teaching students the fundamentals of casting design. Prof. D. S. Eppelsheimer, University of Missouri School of Mines and Metallurgy, presented the results of a survey of "baby" cupolas at eight major universities, such economical apparatus enabling the carrying on of several simultaneous experiments.

In summarizing a paper previously presented at an A.F.S. Convention, Prof.

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Southeastern Regional Conference Sets New Attendance Record

J. P. MC CLENDON / *Supt. Services, Stockham Valves & Fittings, Inc., Birmingham, Ala.*

■ The Tutwiler Hotel was alive with foundrymen as 667 registered for the Southeastern Regional Foundry Conference in Birmingham, Ala., February 19 and 20, setting a new attendance record for the conference. Participating in the 21st Southeastern Regional were foundrymen from 14 states and Afghanistan. Sponsors of the two-day meeting were the Birmingham District and the Tennessee Chapters and the University of Alabama Student Chapter.

Chairman of the conference was the late (see Obituary this issue) Fred K. Brown, Fred K. Brown Co., Birmingham, chairman of the local chapter. John F. Drenning, Kerchner, Marshall & Co., secretary-treasurer of the Birmingham District Chapter, worked closely with Mr. Brown on all phases of the conference.

The day before the conference, foundrymen of the area motored to the University of Alabama for the annual meeting of A.F.S. national and local officers with the student chapter.

S. C. Massari First Speaker

First technical session of the conference had Technical Director S. C. Massari as speaker. He discussed latest developments in the Society's newest research film *"Effect of Gating Design on Casting Quality."* Vernice I. Byford, Production Foundries Div., Jackson Industries, Inc., Birmingham, was session chairman.

Carrying on where the second film ends, the latest film summarizes trials made with varying runner designs in which special attention was paid to the shape of the system at the base of the sprue. Three basic designs were employed: (1) the inverted T; (2) the enlargement, in which the runner was enlarged laterally but not in depth at the sprue base; and (3) the well, in which the enlargement was increased in depth.

The inverted T, though commonly used, aspirates air severely, as shown by the film, and its use is not recommended. The enlargement proved to be an effective design for reducing turbulence under the sprue and for preventing aspiration of air or mold gases. Its effectiveness was shown to be restricted to narrow, deep runners or square runners.

Summarizing the results of many tests, the film showed that a well below the sprue would keep castings clean. Area of the well recommended is five times the area of the sprue base, while depth below the runner should be equal to the depth of the runner.

Second speaker was Oscar J. Stoesser, Crane Co., Chattanooga, Tenn., who described problems encountered in the production of thin-walled castings and offered a number of solutions. Charles B. Saunders, Tennessee Products & Chemical Corp., Chattanooga, presided at this session.

Principal speaker at the first day's luncheon was A.F.S. Vice-President Collins L. Carter, Albion Malleable Iron Co., Albion, Mich., who discussed progress made by the chapters of the area and national activities of the Society. Mayor Cooper Green of Birmingham welcomed the foundrymen on behalf of the city. Luncheon chairman was Biddle W. Worthington, McWane Cast Iron Pipe Co., Birmingham, conference program chairman.

A.F.S. is entering the greatest period of activity it has ever known, Mr. Carter said as he reviewed recent activities of the Society and its 56 chapters. He cited the increased interest in A.F.S. publications and said that during the past year a number of new and revised volumes had appeared. These included, he asserted, the *High School Foundry Text, Symposium on Gating*, revisions of *Foundry Sand Handbook* and of *Copper-Base Alloys Foundry Practice*, two symposia on safety, hygiene, and air pollution, and the *Patternmaker's Manual*. Available soon, he said, would be *Statistical Quality Control for Foundries* and

Left—A.F.S. Vice-President Collins L. Carter, Albion Malleable Iron Co., Albion, Mich., reviewing Society operations at Southeastern Conference luncheon. Right—International President L. N. Shannon, Stockham Valves & Fittings, Inc., Birmingham, enjoys remarks of Toastmaster Charles S. Northen, U.S. Pipe & Foundry Co., Burlington, N.J., during banquet concluding conference.

Glossary of Foundry Terms, and later the *College Foundry Textbook* and additional safety and hygiene treatises.

A.F.S. must point the way as well as record what has been done, stated Mr. Carter, in listing the Society-sponsored research projects carried on at universities, research centers, and various foundries.

Will we do the job or will some enforcement agency do it for us, Mr. Carter asked in referring to the Safety and Hygiene and Air Pollution Program carried out for the industry by A.F.S. Foundries must accept their responsibilities as members of the industrial community, he declared, in calling for support of the 10-year, $350,000 project to which foundries large and small are contributing.

Continuing the technical program after lunch, Richard Herold, Foundry Products Dept., Borden Co., New York, spoke on shell molding. J. A. Wickett, Sloss-Sheffield, Birmingham, was session chairman.

Shell Molding Profitable

Both jobbing and production foundries are profitably engaged in shell mold castings production, said Mr. Herold. It is difficult to justify shell molding on the basis of better casting surface alone, he declared, but shell molding should be considered for production runs of castings requiring finish machining. He cited examples of castings being produced in shell molds.

Lack of concentricity in cylindrical castings caused when molds spread at the parting line is being studied from the standpoint of using sand additives with expansion lower than that of silica. In discussing gating, Mr. Herold said that bottom gating is required to permit the mold cavity to fill with minimum turbulence. Shell molding has already cut into welded fabrication and forging fields, and there are still many unexploited applications, he concluded.

Next speaker was Floyd R. Schulz, Mechanical Handling Systems, Inc., Detroit, whose subject was *"Mechanical Equipment for Shell Molding."* Only mechanization will allow full development of the potentialities of the shell molding process, he asserted. Illustrating his remarks with a movie, he described a 12-station which produces approximately 500 shell molds an hour and is almost completely automatic. He also told of a single-station machine with a production of about 40 shells an hour.

Chairman of the shell molding equipment session was Charles C. Salvage, National Cast Iron Pipe Div., James B. Clow & Sons, Tarrant City.

L. C. Beers, Claude B. Schneible & Co., Detroit, presented a talk and movie entitled *"The Invisible Shield."* He described the mechanization of the Studebaker foundry and showed how air is used to protect foundry workers from radiation, dust, and fumes. Harry M. Burns, Stockham Valves & Fittings, Inc., Birmingham, presided.

Last speaker of the day was George K. Dreher, Foundry Educational Foundation, Cleveland, who outlined the growth of FEF and showed how it is supplying the foundry industry with engineering graduates interested and qualified for a foundry career. Chairman was Howard Nelson, Hill & Griffith Co., Birmingham.

Conference attendants gathered in the ballroom of the Tutwiler for an entertainment program to conclude the first day's activities.

The morning of the second day was left open for visits to plants of 25 foundries and foundry supply firms of the area.

Resuming the program of technical talks in the afternoon, conference-goers heard Keith D. Millis, International Nickel Co., New York, tell of *"Developments to Date in Ductile Iron."* Presiding was C. K. Donoho, American Cast Iron Pipe Co., Birmingham.

During the four years in which ductile iron has been made commercially, production has risen from about 3,500 melt-tons to well over 80,000 melt-tons in 1952, Mr. Millis said. As properties become more universally known among engineers, he predicted, growth will be even more accelerated.

Ductile iron is used, according to Mr. Millis, for one or more of the following properties: high strength and toughness, heat resistance, wear resistance, and pressure tightness.

Warren C. Jeffery, assistant professor of metallurgical engineering at the University of Alabama, presented a paper based on research conducted with Edwin E. Langer, Jr., and Ghulam D. Azizi, entitled *"Effects of the Carbon Equivalent on the Properties of Cast Iron."* K. P. Efird, Jr., Central Foundry Co., Holt, was session chairman.

Model 35 Duplicate Heats

Prof. Jeffery described work in which 35 duplicate heats were made to measure the influence of carbon equivalent values from 2.95 to 4.90 on mechanical properties as well as chill, fluidity, shrinkage, machinability, and microstructure of cast iron. Using phosphorus levels of 0.20 and 0.70 per cent, he concluded from the work that the carbon equivalent as expressed by the formula $CE = \%TC + 0.3(\%Si + \%P)$ is sufficiently valid to be used for estimated the properties of cast iron from chemical composition. Maximum transverse strength of plain, uninoculated cast iron is at a maximum (2600 lb. 1.2-in. bar) at a CE of 3.6-3.8 while maximum deflection occurs at a CE value of 4.2 to 4.5. Tensile strength decreases as CE increases and

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Left—S. C. Massari (left), A.F.S. technical director, discusses his technical talk with Vernice I. Byford, Jackson Industries, Inc., who presided at opening session. Right—Some of the foundrymen who made the Southeastern Regional tick are (left to right): Richard L. Jackson, Jackson Industries; Morris L. Hawkins, Stockham Valve & Fittings; John F. Drenning, Kerchner, Marshall & Co.; William K. Bach, Foundry Service Co.; and T. H. Benners, Jr., T. H. Benners & Co.

Show Continued Advances in S & H & AP Work and Finances

■ Health and safety work among foundries and related groups forges ahead as national committees operating under the Safety & Hygiene & Air Pollution Program continue to develop new, useful material for the castings industry. Latest committee work includes:

SAFETY—Working on revision of A.F.S. Manual on good safety practices. Petitioning National Safety Council to set up separate section for foundry industry.

HYGIENE—Developing manual on dust control and ventilation which is expected to be published by fall.

AIR POLLUTION—Making extensive progress in manual covering air pollution. Will include valuable information which will help small foundries meet local air pollution ordnances. Committee is making field trips to develop factual, practical data which all foundries can apply.

In addition to committee activities, two A.F.S. health and safety conferences have been held this year (University of Illinois, February 17-19 and University of Wisconsin, March 24-25) and a safety training course (Chicago, January 15-16) has been staged.

Latest Contributors

Meanwhile, companies are lending financial assistance to the advancement of the industry's Safety & Hygiene & Air Pollution Program. During the period January 26 through March 26 the following contributed to the S & H & AP fund to bring the total to $72,340.88:

Central Foundry Div., General Motors Corp., Saginaw, Mich.

Erie Malleable Iron Co., Erie, Pa.

Saginaw Foundries Co., Saginaw, Mich.

Baltimore Foundry & Machine Corp., Baltimore, Md.

Federal-Mogul Corp., Detroit.

Weil-McLain Co., Michigan City, Ind.

Eaton Mfg. Co., Detroit.

Perfect Circle Corp., Hagerstown, Ind.

Hunter Douglas Corp., Riverside, Calif.

Stockham Valves & Fittings, Inc., Birmingham, Ala.

(EDITOR'S NOTE: Checks and pledges for the S & H & AP Program should be made payable to AMERICAN FOUNDRYMEN'S Society, 616 S. Michigan Ave., Chicago 5, Ill.)

But foundrymen are not contributing, then sitting back to watch the program operate. In addition to promoting the industry's welfare through contributions, they are working locally to improve health and safety in their foundries and their communities.

Foundries Active Locally

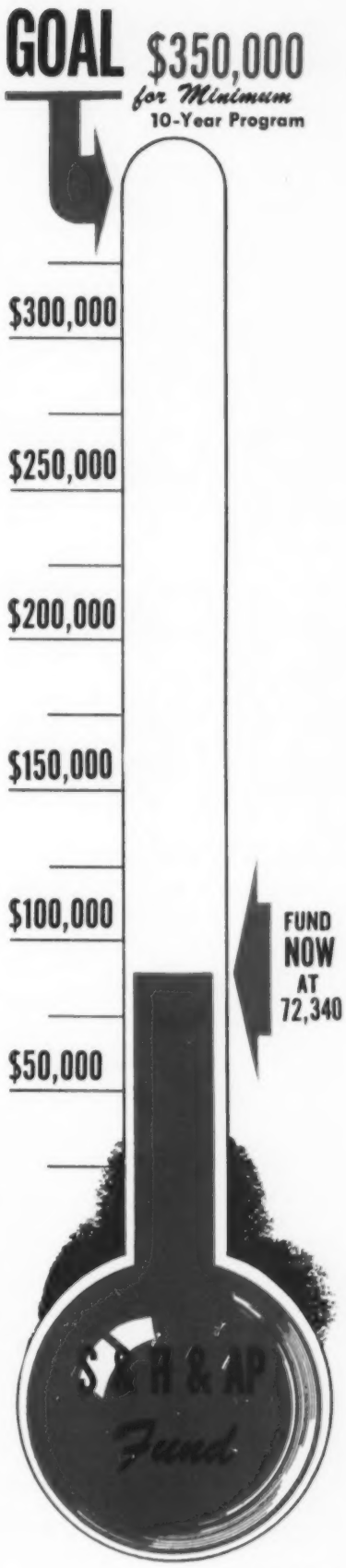
Thus, on February 6, when representatives of industry met under the auspices of the Ohio Manufacturers Association, five Ohio foundries were in the group discussing proposed Ohio air pollution legislation. As a result, Henry J. Trenkamp, Ohio Foundry Co., Cleveland; Peter E. Rentschler, Hamilton Foundry & Machine Co., Hamilton; and R. J. Redmond, Buckeye Foundry Co., Cincinnati, were designated as a committee to represent the foundry industry in the OMA's air pollution project.

The S & H & AP Program was revived by A.F.S. at the request of the National Castings Council and the program is actively supported by NCC and its member organizations. One of these, the Foundry Facings Manufacturers' Association, met in Chicago, February 11, to consider S & H & AP Problems and to hear Warren A. Cook, Zurich Insurance Co., talk on noise and air pollution.

On January 29 and 30, the Grinding Wheel Institute called a meeting in Washington, D. C., for the purpose of bringing up to date the code on the use, care, and operation of grinding wheels. Planned for inclusion as a guide to interpretation of the code are practical instructions and methods to be followed with grinding wheels.

Advances in air pollution control using commercially available equipment (AMERICAN FOUNDRYMAN, January, page 61, and February, page 41) point the way to cleaner air, better community relations, and improved foundry practice.

While progress is being made, there is ample room for improvement. Take safety. There has been a slight reduction in the injury frequency rate for all types of foundries according to Bureau of Labor statistics for the third quarter of 1952. The foundry industry as whole, however, has a much higher frequency rate than the all-industry average. The all-industry injury frequency rate for the 1952 third quarter was 13.8 while the foundry industry ran 26.7. Average for the basic steel industry is only 6.2.



Abstracts

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Open Risers

A279. ."The Riser in Gray Iron Casting," O. Cerioli, *Fonderia*, vol. 1, no. 12, December 1952, pp. 451-459 (in Italian).

Rather elementary information is offered on risers, their function, shape, and optimal dimensions, all data being based on empirically determined rules. Open risers alone are considered, the shape recommended being a cylinder of height h and diameter D provided with a neck of height L and diameter d; if s is the thickness of the casting at the point of attachment of the riser, the proportions are as follows: $d = 3/4\ s$; $D = 2d$; $h = 3d$; $L = d$.

Aluminum in Bronzes

A280. ."The Elimination of Aluminum Present in Bronze." G. Blanc and P. J. Le Thomas, *Fonderie*, vol. 80, September, 1952, pp. 3091-3106. (In French).

Excess aluminum should be removed from bronzes because of the detrimental effect on bronze properties and its interference with oxidation treatments. Aluminum is usually removed by selective oxidation or by forming a "milk" which is poured off. The lowering of the aluminum content from around 1 per cent to the order of thousandths of a per cent can be effected. Experimental conditions are described. The oxidation of aluminum by pure and dilute MnO_2 and KNO_3 and by other agents is discussed. Content of aluminum before and after treatment is measured. Other factors, such as temperature of treatment, duration of mixing, zinc content, phosphorous content, and the yield, are also considered.

Mechanical characteristics before and after treatment are tabulated. The influence of the treatment as to decreasing bronze porosity was beneficial. It is concluded that while KNO_3 oxidations give better results, MnO_2 is much easier to use.

Precision Pattern Plates

A281. ."Note on Manufacturing of Precision Pattern Plates," Bernard Faure, *Fonderie*, December 1952, pp. 3227-3232 (in French).

A method of making light cope and drag pattern plates is described for casting thin sections used for heating. The characteristic feature of the plates is the presence of several humps on the reverse side of each plate, which rest on corresponding projections in the supporting piece. The purpose of the humps is to resist the considerable pressures and percussions occurring during the various operations of molding and casting in the machine. Special care is taken for ensuring exact heights of the humps, for which purpose cooling cores are placed in precise positions within the hump-forming holes of the mold.

Blind Risers

A282. ."Notes on Blind Risers, Including Atmospheric Blind Risers," Jean Gélain, *Fonderie*, November 1952, pp. 3163-3182 (in French).

An extensive series of experiments were made with a view to rationalizing the use of blind risers. The problem of their shape and dimensions was approached by testing the practical validity of the fundamental equation correlating the time of solidification with the ratio of volume to surface. Next, the properties of the neck in a domed-cylinder riser were studied, as was the problem of the "field of action" of a blind riser as a function of the latter's shape and dimensions and of the access to free atmosphere. Tests of various modes of arrangement of several risers in casting intricate shapes complete the general study. A special section is devoted to uses of blind risers in the cast iron foundry.

Carbon for Lining

A283. ."Carbon: A New Cupola Refractory?" P. Provias, *Canadian Metals*, vol. 15, no. 12, November 1952, pp. 32-34.

Carbon is an excellent refractory since it is not wet by molten iron or slag, not absorbed by iron produced in the cupola, and is resistant to abrasion by slag and iron and to thermal shock. It has a low coefficient of thermal expansion, making it applicable to cupola use. However, easily reduced slags tend to oxidize it and, in air, carbon begins to oxidize at 660F. The present use of carbon results from a review of refractory properties, making these factors apparent: (1) refractories might be improved; (2) most of the linings were lost through slagging; and (3) slagging is the most vital part of cupola operations. Methods indicated were the adjustment of fluxes to minimize attack on acid refractory linings, or a change to a neutral lining such as carbon. The experimental work is described.

The original installation of carbon in the well area met expectations: no slag adherence or penetration, no cracking or spalling and no maintenance beyond water-spray cooling. Carbon was also applied to the trough, tap-hole, and breast with satisfactory results; in the melting zone, best results are obtained with carbon brick or paste in combination with other materials. Slag adherence was reduced to a minimum by facing the slag dam with carbon paste and using carbon blocks for the notch and runoff.

Accident Prevention

A284. ."Prevention of Accidents in Foundries," Giulio Foa, *Fonderia*, vol. 1, no. 10, October 1952, pp. 377-386 (in Italian).

Comparative statistics of accidents in foundries in Italy, U.S.A. and England are followed by recommended safety measures. Various devices are examined for avoiding injuries and chronic diseases traceable to working in the neighborhood of cupolas and in other divisions of foundries. Ventilation problems, together with related legislative measures, are discussed.

Pneumatic Molding Machines

A285. ."Various Aspects of the Design of Pneumatic Molding Machines," J. Broberg and L. Villner, *Gjuteriet*, vol. 42, no. 11, November 1952, pp. 175-191 (in Swedish).

A series of recommendations are addressed to builders of molding machines, as formulated by a special committee of the Foundry Division of the Swedish Federation of Mechanical Engineering Industries. The recommendations concern the materials used in the construction of the machines and various aspects of the design. Thus, all air conduits should be built-in, and all moving parts effectively protected from deterioration by sand. Centralized lubrication, ball bearings, pressure gauges, fool-proof flask clamps and locking pins, faster lifting movement, and painting in light colors are among items recommended for improved efficiency and safety. 31 photographs and drawings illustrate the points discussed.

news of technical committees

Cupola Research

Chairmanship of the Cupola Research Committee has been filled after prolonged vacancy with the announcement that Hyman Bornstein has accepted the office. Former national president of A.F.S., and with Deere & Co. for more than 20 years, Mr. Bornstein is now retired and has most recently served as metallurgical advisor to the Government of Israel under the United Nations Technical Assistance Program. A tentative plan calls for a meeting of the Committee on Sunday, May 3, day before the opening of the A.F.S. Annual Convention.

The Cupola Research Committee has many important projects on the agenda but the most pressing will be the preparation of a revised edition of the *Handbook of Cupola Operation*.

Dust Control

At a Chicago meeting of the Dust Control and Ventilation Committee on March 10, Chairman John G. Liskow led a discussion on several important subjects. In order to acquaint the industry with the work of this Committee, it was suggested that the first part of the *Dust Control and Ventilation* manual either be published as an AMERICAN FOUNDRYMAN article, or as a separate pamphlet. Spirited discussion of the Check List of Foundry Operations (relating to Air Pollution) followed, and it was decided to explore its accuracy and clarity further. The value of foundry industry conferences, as conducted at various universities, was discussed, with reference to reciprocal benefits to both those attending the sessions, and possible help that the industry might provide for the host institutions. The next Committee meeting was scheduled for the morning of Thursday, May 7, during the Chicago Convention of A.F.S.

Fluidity Testing

Because of the recent resignation of Prof. H. F. Taylor as Chairman of the A.F.S. Fluidity Testing Committee, elections were held in February to fill this vacancy. As a result, Jack H. Schaum, who has been associated as research metallurgist with the National Bureau of Standards in Washington, D. C. since 1947, is the new Chairman. Prof. Taylor has agreed to continue to serve as an active member of the Committee.

Air Pollution

A two-day meeting of the Air Pollution Committee was held in Detroit, March 4-5, and was highlighted by field visits to the Ford Rouge plant and the Pontiac plant of General Motors to observe air pollution control equipment in operation. Two cupolas were equipped with wet washers, electrostatic precipitators, and hot blast units. Operation of these systems was discussed in conference with Tom Butler, Ford foundry engineer. At Pontiac, the Committee saw cupolas equipped with the ordinary wet washer type of collector. Charging methods, amounts of water used, disposal methods and other factors were also checked on this visit. Following dinner at the Dearborn Inn, there followed a general discussion of the various equipment inspected during the day. Aubrey Grindle described the new collector which he has recently developed for the hot blast unit. The agenda for the next day included a review of the Check List, and material to go into the manual.

H. Bornstein . . . Cupola Research Chairman

J. H. Schaum . . . . Heads Fluidity Testing

Handbook Revision

Appointment of a General Committee and associated divisional Sub-Committees is virtually complete as AMERICAN FOUNDRYMAN goes to press. The General Committee is headed by John W. Bolton, Chairman, who also heads up the Brass and Bronze Sub-Committee. The Chairman of each of the individual sub-committees is also a member of the General Committee on Revision. These members include T. E. Eagan (Gray Iron), W. E. Sicha (Light Metals), Dr. F. B. Rote (Malleable). No Chairmen have been appointed for either the Steel Division or for the newly formed General Design Section. In mid-March, J. F. Klement, J. H. Lansing, and C. W. Briggs had accepted membership in the latter sub-committee. Other members of the General Revision Committee are: M. E. Brooks, G. W. Johnson, J. H. Lansing, W. W. Levi, and Dr. A. J. Smith.

Committee Meetings

April 7—Revision of Recommended Practices for Sand Casting Aluminum and Magnesium Alloys, Congress Hotel, Chicago.

April 10—Steel Research Committee, Congress Hotel, Chicago.

April 13—Sand Research Committee, Olin Hall, Cornell University, Ithaca, N. Y.

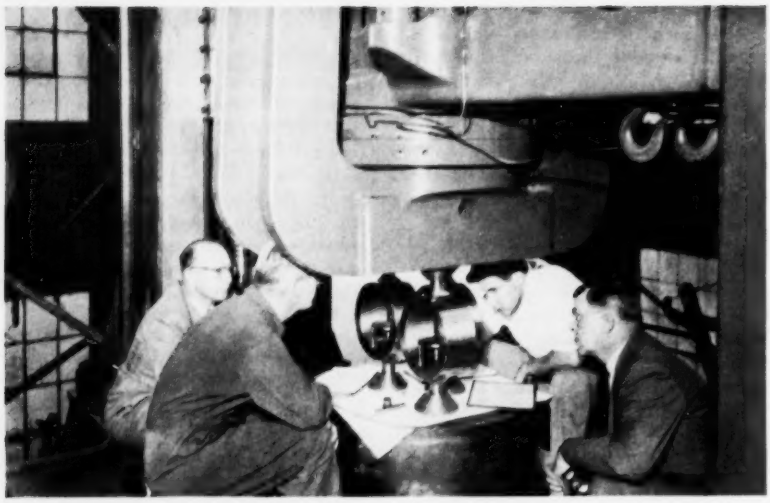
New Training Catalogue

The American Society of Training Directors has revised its catalogue of training materials available through its library at Purdue University. The new catalogue lists material on apprentice training, clerical, office job training, company and product familiarization training, management and professional training, program development and administration, conference leadership, sales and service training, supervisory training and many other phases of on-the-job training.

Training material may be borrowed from the library at Purdue by going directly to the library and requesting the items by catalogue symbol. Arrangements can also be made through local libraries by arranging an "inter-library loan."

Material for inclusion in the ASTD library is solicited.

Copies of the new catalogue may be obtained by sending $1.00 to the *Journal of Industrial Training*, 160 East 48th St., New York 17, N. Y., or to Russell L. Moberly, Secretary-Treasurer, American Society of Training Directors, 2020 University Ave., Madison 5, Wis.



Before its installation in the technical center at National Malleable & Steel Castings Co., Cleveland, this Baldwin 1,000,000 lb hydraulic testing machine was set up for final tests in the Baldwin-Lima-Hamilton Corp. shop at Eddystone, Pa. The 28 ft 7 in. high machine was 15 ft above shop level for tests but will be at floor level when installed. It is the largest universal testing machine with columns made of weldments instead of castings that has been built to date.

Foundry Tradenews

National Lead Co., New York, will operate its newly-acquired **Pioneer Alloy Products Div.** as part of its metal department. Pioneer Alloy's production consists of corrosion-resisting valves, with wide application in the chemical processing and refining industries, and heat-resisting and acid-resisting castings for general foundry use. This added production rounds out the company's metal department output, with a line of stainless steel valves supplementing its lead valves and other lead and lead alloy products.

Lindberg Engineering Co., Chicago, has opened a West Coast plant at Downey, Calif. The new factory contains 12,000 sq ft of production and office space and will be used to manufacture industrial heat treating furnaces and other Lindberg products used in aircraft and other West Coast industries.

Cleco Div., Reed Roller Bit Co., Houston, has announced the appointment of **Maintenance Services,** South Orange, N. J.; **Detroit Supply Company, Inc.,** Schenectady; and **Sears & Bowers,** Easton, Pa., as distributors for Cleco products in their areas.

The stockholders of **Independent Pneumatic Tool Co.,** Aurora, Ill., have voted to change the company's sixty-year old name to **Thor Power Tool Co.** The change, utilizing the trade-mark "Thor," was made in order to eliminate confusion and aid in easier recognition of the company's products. A new Thor sales and service office has been opened in Mexico. The new company, **Thor Tools of Mexico, Inc.,** is at Basilio Badillo No. 47.

Round-the-clock work on the part of the entire **Pekay Machine & Engineering Co.,** organization had them back in production within two days after a fire next-door brought on a flood. The fire did not reach Pekay's premises, but a large part of the shop and offices was under several feet of water as a result of the deluge from fire hoses. The Chicago manufacturer of foundry equipment was back in full production within two weeks.

Detroit Gray Iron Foundry Co., has published a 12-page brochure describing its expanded ferrous casting services. Illustrations show operations at the new Lansing and Rochester, Mich., subsidiaries and the Detroit plant which will now concentrate on production of low, medium, and high carbon steels and a flame-hardening steel for use when a tensile strength of 100,000-110,000 psi is required. Formulae for estimating weight of castings are a feature of the brochure. Included are tables showing the physical properties and chemical range of the firm's standard alloyed cast irons.

Whitehead Metal Products Company, Inc., New York, has been named distributor of **Vanadium Corporation of America** products, principally to iron foundries in the Northeastern United States. Whitehead has offices and warehouses in New York City, Buffalo, Syracuse, Philadelphia, Baltimore, Harrison, N. J., and Cambridge, Mass. They operate offices in New Haven, Albany, Schenectady, Rochester, and Richmond, Va.

The first national plans which permit users to lease materials handling equipment has been announced by three manufacturers—**Automatic Transportation Co.,** Chicago; **Philadelphia Div. of Yale & Towne Manufacturing Co.;** and **Rapids-Standard Co., Inc.,** Grand Rapids, Mich. Under the plans use of fork trucks and other materials handling equipment is made available on payment of monthly rentals. Corollary plans for users who wish to purchase equipment on installment terms rather than lease can also be arranged. One plan enables firms to install Rapids-Standard conveyors without making a major capital investment.

Walley E. George and Samuel M. Dix have announced the formation of a counseling service in Grand Rapids, Mich., to be known as **George & Dix** management consultants. The new firm offers counseling services on production and personnel problems, business and profit analyses and operating controls. Mr. George was a member of A.F.S. Time Study and Methods Committee for many years.

Wanted—Manufacturing & Sales Rights Trade Link

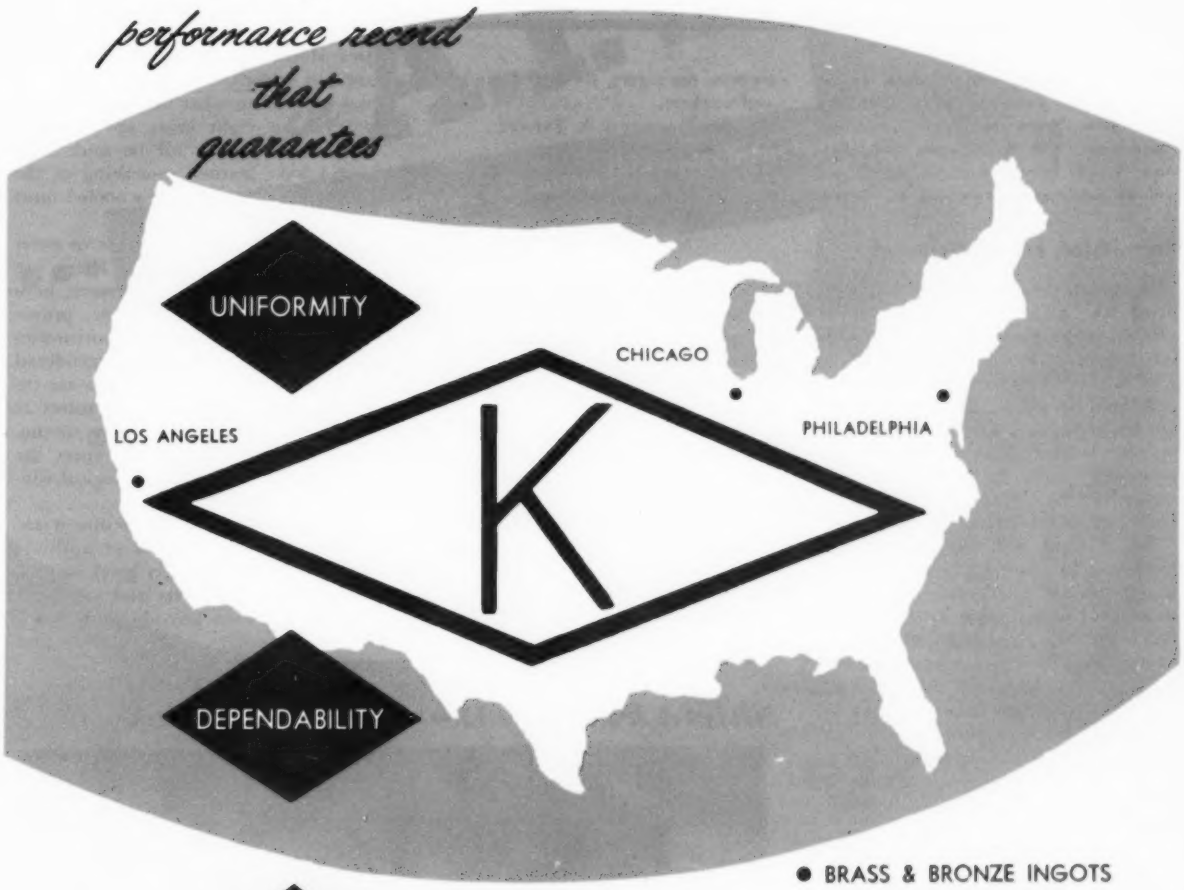
Prominent Australian public company, operating large steel foundries, forge, machine shops, seeks link with American concerns by acquiring manufacturing rights suitable for Australian requirements, proprietary lines in general engineering and new devices. Manufacturing rights involving steel castings would receive special consideration but not an essential condition. Suitable agencies would also be considered.

Company's executive officers will attend A.F.S. Convention, Chicago, May 4, and remain in America throughout May and early June to investigate such propositions.

American Foundryman N-145

serving the non-ferrous field from coast to coast

a performance record that guarantees



- BRASS & BRONZE INGOTS
- MANGANESE BRONZE
- ALUMINUM BRONZE
- NICKEL SILVER
- PHOSPHOR COPPER

Foundrymen know the value of Kramer's years of research and achievement . . . they look for the Kramer and Ajax trade-marks on brass and bronze ingots.

H. KRAMER & CO.

PLANTS: **CHICAGO** • **PHILADELPHIA** (AJAX METAL DIVISION) • **LOS ANGELES**

OFFICES IN PRINCIPAL CITIES

Letters to the Editor

All letters of broad interest which do not violate A.F.S. policy or good taste are publishable. Write to Editor, American Foundryman, 616 S. Michigan Ave., Chicago 5, Ill. Letters must be signed but will be published anonymously on request.

Permission Freely Granted

We are requesting permission to reprint the paper "New Methods in Metal Patternmaking" by H. J. Jacobson, Industrial Pattern Works, Chicago (A.F.S. *Transactions*, vol. 60, p. 529), presented at the 1952 Convention, in our house journal, *The Modern Foundry*. Our journal is posted gratis to all foundries and foundry executives throughout Australia, New Zealand, the Union of South Africa, etc.

We thought that the article "New Methods in Metal Patternmaking" would be of particular interest to thoughtful foundrymen in this part of the world, showing a development of pattern making which—through lack of large scale production—they may not be able to use, but would be very interested in learning about.

William A. Gibson,
Managing Dir.
Gibson Engineering (Sales)
Pty. Ltd.
Sydney, Australia

Terms & Conditions of Sale

Kindly send at your earliest convenience 100 copies of "Terms & Conditions of Sale" mentioned in the Talk of the Industry page of the February issue of American Foundryman.

R. D. Zangrilli, *President*
Standard Electric Steel
Castings Co.
Springfield, Mo.

"Terms & Conditions of Sale" was developed jointly by the National Association of Purchasing Agents and the Non-Ferrous Founders' Society. Request has been forwarded to the latter where copies are available at 1½¢ each. Address of NFFS is 192 N. Clark St., Chicago 1, Ill.

Need Films in Pakistan

One of our experts on a technical assistance mission to Pakistan has asked for motion pictures illustrating foundry techniques. The films, 16 mm silent or sound, will be shown to foundry owners, managers, foremen, engineers, and workers.

Raymond A. Frigon,
Tech. Officer
Technical Assistance
Administration
United Nations
New York

The enclosed A.F.S. Film Directory contains a number of films which probably would be helpful. Note that the directory lists some films for sale while others are available on loan. Except for the A.F.S. films on "Effect of Gating Design on Casting Quality," the films should be obtained directly from the source indicated in the directory. The A.F.S. films report on fundamental research carried out under Society sponsorship and have been widely shown in the United States and Canada. Copies have been purchased in England, Switzerland, and Germany.

Takes Educators' Side

In the September 1952 issue of American Foundryman, there appeared an article entitled *"Are Technical Graduates Getting Adequate Training in College?"* by Hiram Brown, chief metallurgist, Solar Aircraft Company, Des Moines, Iowa. Mr. Brown and I are old friends, so I can take him to task a little on what he has said.

Seven or eight years ago I would have concurred in all he said. Now that I have learned something of the problems of engineering schools I must take issue on some points.

Why does a student decide to enter a certain field of study? There are many reasons: parental pressure, hero worship, popular attention, propaganda for certain fields, opportunities in given fields, enthusiasm engendered by teachers, etc. Many students are exposed to several of these pressures at the same time. Under such circumstances, it is too much to expect the immature mind to reach a logical conclusion.

At this institution all freshmen are required to take a series of aptitude tests, and there appears good correlation between the tests and scholastic success. We even provide an optional

continued on page 194

Shield Protects Workers in Cupolas

A shield, placed in a cupola to prevent solids from falling on workmen while melting zone is repaired, has been found especially useful in installations where cinder catcher on top of the cupola accumulates fine particles forming solid mass which may fall during cooling period. Shield shown is placed on wishbone through charging door with additional plates laid on each side to cover entire cupola area. Debris on shield is evidence of its safety value. If cupola has no wishbone, other methods of supporting shield may be used. (Reported by Tom Butler, Ford Motor Co., Dearborn, Mich.)

Invest... in A.F.S. Membership

Exhibits at biennial A.F.S. Foundry Show enable Members to inspect latest foundry equipment and supplies.

... if you are looking for profitable and lasting friendships in the foundry industry

... if you recognize the value of being well-informed on the latest foundry techniques and applications

... if you want access to a constant source of help relating to casting and operational problems

... if you want to be an integral part of a group of progressive foundrymen who freely contribute to an exchange of knowledge and experience for personal advancement and industry progress

Membership in A.F.S. . . .

represents an investment in an essential industry . . . actually, job insurance . . . because, through Society service and Society contacts, you endow yourself with a technical knowledge leading to self-development and a better job as an informed employee.

Committee Activities . . .

Over 500 Members serve voluntarily on the many committees of A.F.S. and its Chapters, finding in these activities and associations a worthwhile opportunity to advance themselves, their firms and the industry they represent. A.F.S. welcomes members to Committee Service.

Chapter meetings, regional conferences and National Conventions promote friendships . . . invite exchange of ideas.

A.F.S. Publications . . .

The dissemination of authoritative information leading to better foundry practice—in other words, better castings through simplified production procedures at minimum cost—and products is another primary function of the American Foundrymen's Society. In line with this thinking, Society publications are constantly developed through A.F.S. Committee projects. Members enjoy special discounts on all book purchases.

Authorities in modern foundry practice regularly present the latest information for the benefit of A.F.S. Members.

American Foundryman . . .

Announcements and reports of all A.F.S. activities regularly appear in AMERICAN FOUNDRYMAN—membership service includes a monthly copy of this technical-practical magazine which is published to assist the American Foundrymen's Society in keeping the industry progressive, so that all branches of the metal castings field can compete with modern thinking in research, design, engineering and production.

Recognition of outstanding service and encouragement of youth activities build a stronger, more unified industry.

AMERICAN FOUNDRYMEN'S SOCIETY

616 South Michigan Avenue, Chicago 5, Illinois

Foundry men in the News

Richard J. Stockham has been elected president of Stockham Valves & Fittings, Birmingham, Ala., and **Herbert C. Stockham,** re-elected chairman of the board. Other re-elected officers are **Douglass W. Stockham,** vice president and secretary; **L. N. Shannon,** vice president; **R. L. Stewart,** vice president; and **T. B. Noble,** treasurer. The newly Stockham president, a former vice president, is also president of Wedgeplug Valve Co., Inc., New Orleans.

Richard J. Stockham

George K. Dreher, executive director of the Foundry Educational Foundation, Cleveland, leaves this post to become a director of Waukesha Foundry Co., Waukesha, Wis., effective May 1. He will be in charge of the foundry, including research and development, and personnel. Mr. Dreher has been executive director of FEF since its organization in 1947. A graduate of Lawrence College, Appleton, Wis., he was with Ampco Metal, Inc., Milwaukee, from 1930 to 1946, serving as plant manager and later as vice-president in charge of operations. Before going to FEF he was vice-president and general manager, Rogers Pattern & Foundry Co., Los Angeles. Long active in A.F.S., Mr. Dreher has served as a national director, on a number of national committees, and as president of the Wisconsin Chapter. He has prepared a number of papers and articles on foundry work and educational affairs.

George K. Dreher

Edward J. Walsh becomes executive director of the Foundry Educational Foundation on May 1. He was formerly executive secretary of the National Foundry Association, Chicago. Mr. Walsh attended St. Mary's College and Georgetown University before serving in the Navy in World War II. He became associated with NFA in May 1950 and was appointed executive secretary in the summer of 1951.

Edward J. Walsh

Charles T. Sheehan became executive secretary of the National Foundry Association effective April 1. An attorney, Mr. Sheehan has served NFA for one and one-half years as regional counsel and assistant to the executive secretary.

Charles T. Sheehan

Glenford C. Nash, formerly with Detroit Electric Furnace Div., Kuhlman Electric Co., is now sales-service engineer for Proof Co., Goshen, Ind.

Bryan Rudder, formerly sales engineering supervisor, A. P. Green Fire Brick Co., Mexico, Mo., has been named a direct salesman for the company's Philadelphia office.

Frank G. Hough Co., Libertyville, Ill., appointed **G. A. Tamblyn,** sales manager. He has been with the company 11 years and assistant to the sales manager since 1948.

James Barr, Jr., has joined Otto H. Rosentreter, South Gate, Calif., in the promotion of sales and service for National Engineering Co., Chicago, and Foundry Equipment Co., Osborn Manufacturing Co., both of Cleveland.

John W. Weaver has been named sales manager of the Casting division, Waukesha Foundry Co., Waukesha, Wis. Mr. Weaver has been engaged in sales work for the company for 18 years.

Warren L. Borchard, until recently with Milwaukee Foundry Equipment Co., Milwaukee, has been appointed sales representative, Wisconsin Gray Iron Foundry Co., Milwaukee,

R. Dyner, formerly with Marathon Foundry & Machine Co., Wausau, Wis., has joined Bethlehem Foundry & Machine Co., Bethlehem, Pa.

H. Pagels has been appointed vice-president in charge of manufacturing, and **F. C. Messaros** vice-president in charge of engineering, American Engineering Co., Philadelphia.

continued on page 195

THE MOST *Economical* WAY TO MELT *Quality Bronze*

LIFT-COIL FURNACES *can melt different alloys simply by switching crucibles.*

AJAX-NORTHRUP INDUCTION FURNACES

An Ajax-Northrup equipped bronze foundry, melting a wide variety of alloys in lift-coil furnaces, reports 10% higher tensile strength for certain of its induction-melted alloys . . . and has reduced melting costs by over $33.00 a ton at the same time!

Similar performance is reported by users of the larger tilting furnaces. The tilting units are slightly more efficient than the lift-coil equipment, and are used where ability to switch alloys frequently is less important.

If you haven't looked into the possibilities of induction melting for your non-ferrous foundry lately, we'd like to show you some of the data we've gathered from recent installations. Just write or phone us.

TILTING FURNACES *are used for larger quantities, or special production runs.*

149

AJAX NORTHRUP

INDUCTION HEATING AND MELTING

AJAX ELECTROTHERMIC CORPORATION
Ajax Park, Trenton 5, New Jersey

Associated Companies

AJAX ELECTROMETALLURGICAL CORP.
AJAX ELECTRIC FURNACE CORPORATION
AJAX ELECTRIC COMPANY, INC.
AJAX ENGINEERING CORPORATION

Since 1916

chapter news

Philadelphia

D. E. Best
Bethlehem Steel Co.

Principal speaker at the February meeting of the Philadelphia Chapter was W. S. Pellini, Naval Research Laboratory, who discussed the general problem of the feeding range of risers.

Extensive research which has been conducted on this subject at Naval Research Laboratory was summarized as Mr. Pellini pointed out that the casting rather than the riser primarily determines the distance to which risers feed to soundness. He said that feeding range as related to centerline shrinkage (or weakness) should not be confused with riser sufficiency as related to the elimination of under-riser shrinkage.

This last factor, the speaker said has to do with freezing time of the riser as compared to that of the casting proper. A riser may be entirely sufficient to prevent under-riser shrinkage but because of casting geometry, such as uniformity of the section, may feed to soundness (centerline eliminated) for very short distances. Increasing riser size is of no help in such a case.

The talk was illustrated with color slides which served to emphasize the principal points of the presentation. The talk was a preview of the presentation which Mr. Pellini will make in an A.F.S. official Exchange Paper to the International Foundry Congress to be held in Paris next September.

Eastern Canada

Alf Wells
Dominion Engineering Works, Ltd.

"Modern Development and Coremaking Problems Relative to Pattern Making" was the subject of an address presented by Franz Schumacher, Cooper Alloy Foundry Co., Union, N. J., at a recent meeting of the Eastern Canada Chapter.

Mr. Schumacher insisted that the pattern shop is the key to the foundry and the tendency is for more and more molding to be done in the pattern shop.

That situation is reflected in the quality of patterns, Mr. Schumacher pointed out. A cheap pattern he said is not necessarily a pattern which costs the least but rather one from which the speediest and best production can be obtained. His own foundry mounts (as standard practice) any pattern for more than six castings—and usually makes a new pattern, to their requirements, where more than 24 castings are required. He explained that actually this practice more than paid pattern-shop costs in increased production.

The speaker stressed the need for using all possible sources of knowledge to overcome foundry problems. Even the apprentice may have ideas worth investigating, he suggested.

With respect to core blowing, Mr. Schumacher stated that molders should be required to teach the patternmaker the things which he has learned from experiences in this and other purely foundry problems.

Returning to the subject of matchplates, Mr. Schumacher again emphasized the good qualities of plastic matches inserted in plastic faced plywood boards and locked by means of cerra metal. He also explained that in core boxes, aluminum is superior to wood and that when they can be made from plastic masters are often no more costly. He explained that he used a refinement of the core stick or dummy technique.

The core stick is first sprayed with cerra metal, or other low melt metals, to the thickness of 1/32 in. after which it is covered by about three layers of plaster soaked burlap, he stated that this made a strong master with a mirror-like finish on working faces. The box made from such a master can be guaranteed to retain its original accuracy which is not the case with a wooden core box.

It was also suggested that when dryers are required, especially in the case where dryers are of material different to the core box, that they be cast first. Usually many dryers are required to one core box and it is easier to adjust the core box to the cast dryers rather than try to get dryers perfectly aligned with the box.

Central Illinois

L. E. Kinsinger
Caterpillar Tractor Co.

Chairman George Rockwell, Caterpillar Tractor Company, Pekin, Ill., appointed the 1953 Nominating Committee at the Chapter's March Meeting. The Committee is comprised of Robert Dickison, Brass Foundry, Peoria, Ill., Ralph Beebe, International Harvester Co., Canton, Ill., and George

W. S. Pellini, Naval Research Laboratory, Washington, D. C. (second from right) takes time out from discussion of feeding range of risers for photo with (left to right) E. H. Berry and E. A. Zeeb, Dodge Steel Co., Philadelphia, and D. E. Best, Bethlehem Steel Co., Bethlehem, Pa.

Guest Speaker R. P. Schauss, Werner G. Smith, Inc., Chicago, discussed program for Central Illinois Chapter's March meeting with L. J. Voros (left), Caterpillar Tractor Co., Peoria, and Ralph Beebe, International Harvester Co., Canton, Ill.

Posed for photo at February meeting of N. W. Pennsylvania Chapter, Guest Speaker R. A. Colton, American Smelting & Refining Co., Barber, N. J., is flanked by Charles Gottschalk, Cascade Foundry, and Fred Carlson, Weil-McLain Co., Erie.

Schuller, Caterpillar Tractor Co., Peoria, Ill.

Louis J. Voros, Foreman, Caterpillar Tractor Company, Peoria, served as Technical chairman and introduced the speaker, Robert P. Schauss, Werner G. Smith, Inc., Chicago.

Mr. Schauss chose as his subject "*Core Practice as Related to Foundry Losses.*" He pointed out the fact that excess foundry scrap can many times be charged to improper cores. Expounding on some of the causes of improper cores and the effects on castings, he listed these main causes: sagging, unbaked, overbaked, soft cores, hard cores, poor core making and venting.

A question and answer period followed the main address. The meeting was concluded with a word of commendation from the Chapter Chairman concerning the Student Chapter at the University of Illinois, and the suggestion that members visit their chapter.

Eastern New York

A. J. Kiesler
General Electric Co.

Program for the February meeting of the Eastern New York Chapter featured a discussion on "*Foundry Manpower Problems in the Tri-City Area*" by a panel of educational experts.

Ray E. Ellis, General Electric Co., Schenectady, N. Y., described the problems of industry in attracting foundry Apprentices. Allen K. Booth, Troy, New York, Chairman of the Tri-City area War Manpower Commission, told the group of competition being given the foundry by other industries in the area.

James Allgeier, Troy School System, explained how area high schools could provide foundry training and manpower, once aware of the need and requirements. William N. Fenninger, New York Education Department, outlined the aid that state-operated, veteran training schools could provide.

E. S. Lawrence, General Electric Co., Schenectady, N. Y., reviewed the results of the Foundry Employment Questionnaire recently sent to foundries in the area to determine the type, number and need for foundry manpower at all levels—college trained, apprentice, part-time training, etc.

After the presentations, the panel was quizzed on each phase of Educational needs. The meeting appeared to be a starting point for an intensive educational program in the area. It established the need and proposed practical solutions. All indications are that there will be increasing interest on the part of foundrymen, educators and the community in a complete foundry Education Program.

Corn Belt

Vernon J. Holmes
Paxton-Mitchell Co.

The Rome Hotel in Omaha was the scene of the March meeting of the Corn Belt Chapter, to which a near-record crowd was attracted. Guest speaker was W. A. Hambley of Krause Milling Co., Birmingham, Mich. He spoke on "*Gray Iron Casting Defects,*" making effective use of slides. The high cost of excessive foundry scrap formed the central theme of his speech. This type of wastage, he declared, is reflected in lowered employee morale and increased costs to customers.

Mr. Hambley delivered a stern warning to foundrymen: "The foundry industry must wake up! Plastics are entering the foundry field and we must remain alert and progressive."

Alex D. Matheson, Kelsey-Hayes Wheel Co. and member of the A.F.S. National Board of Directors, brought greetings from National Headquarters to the Corn Belt Chapter.

Northwestern Pennsylvania

Roy A. Loder
Erie Malleable Iron Co.

Approximately 100 members and guests enjoyed the cocktail hour and dinner preceding the February meeting of the Northwestern Pennsylvania Chapter. After dinner, R. C. Strong, Griswold Mfg. Co., Erie, Pa., presented a moving picture entitled "*Shell Molding*" which depicted the advantages of high-speed production equipment—in this case capable of producing 500 shells per hour.

Speaker of the evening, R. A. Colton, Federated Metals Div., American Smelting & Refining Co., Barber, N. J., discussed "*Making Better Castings.*"

His talk covered such subjects as sand, sand control, metals and alloys and their control, melting, and melting control. Considerable time was devoted to a review of gating designs and theories.

Metal flow into the mold cavity was also illustrated by Mr. Colton showing that where more than one in gate was used on flat casting, most of the metal may enter through one opening.

Texas

Approximately 50 persons attended the March meeting of the Texas Chapter, held at Beaumont, Texas. The audience included representatives from foundries from Lufkin, Fort Worth, Tyler, Houston, Dallas, Port Arthur, and Beaumont. William Ball, Jr., of R. Lavin and Sons, Inc., Chicago, addressed the meeting as guest speaker. His subject was "*Effective Essentials Required to Make Good Castings.*"

Interest in these Texas Chapter meetings is mounting, as indicated by the fact that some representatives at the March session traveled as much as 300 miles to attend.

continued on page 181

EVERY DELTA Foundry Product is backed by continuing and exhaustive laboratory research to safeguard quality and maintain absolute uniformity. From raw materials to the finished product manufacturing processes proceed under an automatic and persistent policy of laboratory control.

DELTA Foundry technicians are specialists in cutting cleaning room costs by providing formulas for the rapid production of finer-finished castings, which require a minimum of cleaning room time.

DELTA

FOR MOLDS

DELTA Core & Mold Washes for steel, malleable, gray iron and non-ferrous metals.

PERMI-BOND (seacoal replacement)

PARTEX (Nut Shell Parting)

Liquid Parting

Spray Binders

BONDITE

Mold Seal Compounds

Sand Conditioning Oils

96-B SAND RELEASE AGENT

DRI-BOND BINDER

FOR CORES

DELTA Core & Mold Washes for steel, malleable, gray iron and non-ferrous metals.

Mudding and Patching Compounds

No-Vein Compound

DRI-BOND BINDER

Core Red Dip Oils

Sand Conditioning Oils

Core Oils

PARTEX (Nut Shell Parting)

Liquid Parting

BONDITE

Core Paste

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

VISIT US AT OUR SUITE
at the
SHERMAN HOTEL, CHICAGO, ILL.
during the
57th
ANNUAL A. F. S. CONVENTION

A COMPLETE LINE OF *Scientifically* CONTROLLED FOUNDRY PRODUCTS FOR *FASTER PRODUCTION* OF FINER-FINISH CASTINGS

... at lower cost!

Get the Facts ...

Working samples and complete literature on Delta Foundry Products will be sent to you on request for test purposes in your own foundry.

Dry dipping with DELTA Z-Z-KOAT

Green dipping with DELTA GRAKOAT

Dry dipping with DELTA GRAKOAT

Photographs Courtesy of Studebaker Corporation

Book Reviews

Metallurgical Atomics

Atomic Theory for Students of Metallurgy . . **by William Hume-Rothery. 331 pp., illustrated. Published by The Institute of Metals, 4 Grosvenor Gardens, London, S.W. 1, Eng. $3.50. (1952)**

New theories of the past 25 years have in many cases provided a new concept of the atomic structure of metals. This book has been written primarily to acquaint advanced students and research workers in metallurgy with the ideas underlying the new theories. For this purpose, the electron theory of metals and a general background in nucleonics is included as refresher material. Much of the data in the book will be of considerable interest to physicists and chemists.

Production Costs

How to Control Production Costs . . **by Phil Carroll. 272 pp., illustrated. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36. $5.00. (1953)**

A consulting industrial engineer who has published several works on timestudy and cost control presents a practical explanation of costs for management executives without accounting background. Methods of achieving and controlling accurate product cost data are detailed in step-by-step procedures. Five factors in cost control are emphasized: the importance of accurate sales forecasts; controlling production-delivery cycles; reducing inventory, and shortening the process cycle; saving excess finishes and tolerances through realistic engineering; using incentives; and reporting results promptly. Here is a handy book for any type of industry.

Productivity

Progress in Productivity and Pay . . **72 pp., illustrated with charts and graphs. Published by The Eddy-Rucker-Nickels Co., Harvard Square, Cambridge 38, Mass. $2.50. (1952)**

This publication has been prepared by a firm of management consultants who have produced several other works in the field of economics and labor-management relations. This book is a continuing research report based on official U. S. Census of Manufacturers' data, and surveys the relationship of worker productivity and wages for all U. S. manufacturing for the years 1914-47. In addition, the benefits of increased per capita productivity as a contributing factor in the general well being of nations is explored comprehensively.

Band Machining

Band Tool Manual . . **160 pp. Well illustrated. Published by DoALL Co., Des Plaines, Ill. $2.00. (1952)**

Book gives a comprehensive explanation of all band tools used in sawing, slicing, filing, grinding, and polishing. Photos and drawings are used throughout to define terminology, the 16 kinds of tools, and their application to machining. Specific information is contained in the section dealing with characteristics, production rates, tool life, use of coolants and lubricants, surface finish, and dimensional accuracy. Also covered are selection and care of tool guides, joining of blades into bands by butt welding, and corrective measures to be taken to overcome sawing problems.

Metal Data

Metal Data . . **second edition, by Samuel L. Hoyt. 526 pp. Illustrated. Published by Reinhold Publishing Corp., New York. $10.00. (1952)**

This revised edition of the author's popular Metals and Alloys Data Book contains the most recent information on all subjects covered by its predecessor, plus a wealth of new data on such topics as hardenability of H-steels, the new Super Alloys for high temperature stress members, and other new alloys.

Nearly 700 tables and graphs are used to present important data in easy-to-use tabular form for daily reference. Valuable material includes such metallic properties as tensile strength, hardenability, thermal expansion, creep strength, endurance limit and yield strength at normal, subnormal, and elevated temperatures, and for various conditions of mechanical treatment. Among the numerous special features are listings of commonly used test bars, hardness tests, corrosion data, conver-

Continued on page 207

Dedicate ASTE Headquarters Building

Preparing to lay the ASTE plaque in the floor of the national headquarters of the American Society of Tool Engineers, Detroit, are (left to right): Past President William H. Smila; National President Leslie B. Bellamy, and Past President W. B. Peirce. The ceremony was part of the dedication March 16 which coincided with the opening of ASTE's first Leadership Conference.

Chapter News

continued from page 177

Central Ohio

WILFRED W. WHITE
Jackson Iron & Steel Co.

C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, discussed *"Mechanization in Molding"* at the March meeting.

Mr. Nass spoke of the demands for some mechanization in all foundries. Each need is different and mechanization should be designed accordingly. It is as wrong to over-mechanize as to have too little, the speaker asserted, and emphasized the idea that any change made in a foundry should be part of an engineering plan.

Various mechanical devices were shown in moving pictures taken at representative foundries. These illustrated many simple as well as complicated and ingenious devices. The advantages of mechanization includes saving in labor and materials, lessening fatigue, saving space and, of course, producing better castings.

Northwestern Pennsylvania

ROY A. LODER
Erie Malleable Iron Co.

The Northwestern Pennsylvania Chapter has announced a four-day sand school to be held in the Academy High School auditorium, 26th and State Street, Erie, Pa., on May 18-21. These sessions will be conducted by Frank S. Brewster, H. W. Dietert Co., Detroit, each night from 7:30 to 10:30 P.M.

The auditorium has space for over 1000 persons and every one interested in molding and core sands is invited to attend. John Finch, General Electric Co., Erie Pa., is chairman of the affair.

Twin-City

R. J. MULLIGAN
Archer-Daniels-Midland Co.

Good foundry practice in the casting of the light metals and copper base alloys was discussed by Hiram Brown, Solar Aircraft Co., San Diego, Calif., at the February meeting of the Twin-City Chapter.

Mr. Brown's talk emphasized the need for careful control and handling of these highly reactive metals to prevent poor metal quality defective castings. This control begins with the purchase of scrap of known composition and constant quality, and follows through the melting practice, sand control and molding techniques.

Reactivity of these metals is the criterion for control during melting. A neutral or oxidizing atmosphere is essential to the preparation of good quality metal by inhibiting hydrogen porosity. This atmosphere must be continued throughout the life of the molten metal.

Mr. Brown cautioned that test bars are not indicative of the type of metal that is in the casting. The different gating systems between the actual casting and the test bars does affect the quality of the metal. This is particularly true of the light metals as opposed to the ferrous metals.

Keeping of good records in the technical departments and cooperation between the foundryman, technical personnel and shopmen cannot be too strongly emphasized. Mr. Brown concluded that therein lies the backbone of a sound foundry operation.

continued on page 184

This grinder maintains 9500 S.F.P.M. all the way down to the flanges. By merely turning hand wheel, guard is adjusted and spindle speed is increased simultaneously in relation to worn wheel. No wrenches or tools are needed for this adjustment.
Available in both single and twin wheel construction.

Write for catalogue 44 today.

STANDARD'S ***single wheel snagging grinders***

One of the 46 Single Wheel Infinitely Variable Speed Snagging Grinders now at work at Ford's ultra-modern Cleveland Foundry.

Here are the results that Standard type 33V Grinders deliver every day, every time:

- Higher Production
- Faster Metal Removal
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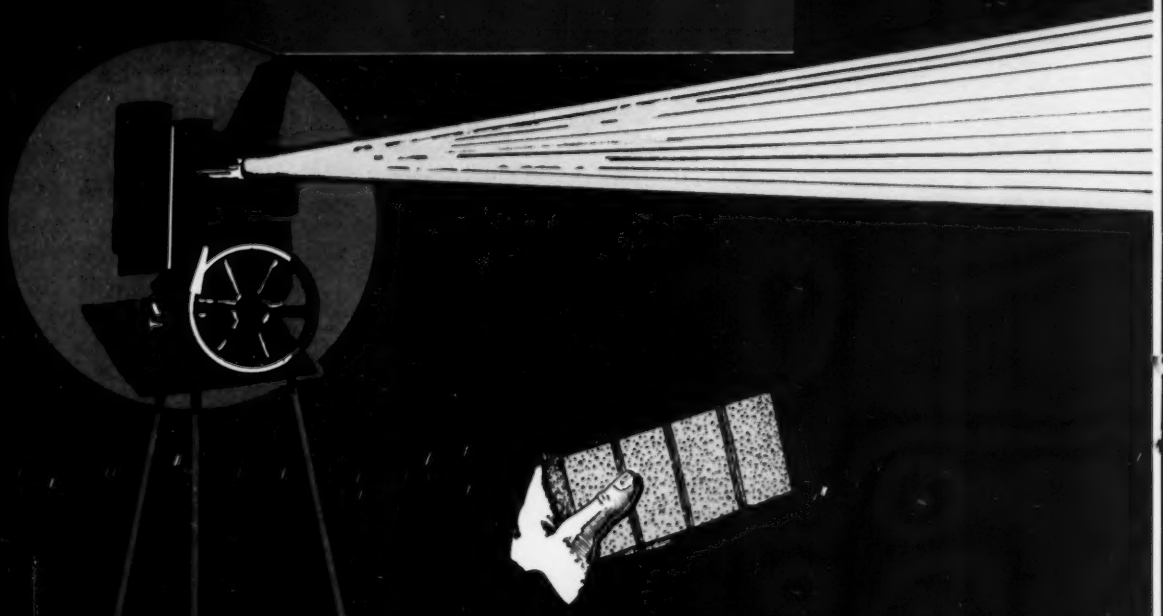
Standardize with
the STANDARD electrical tool co.
MACHINE TOOLS
2546 RIVER ROAD • CINCINNATI 4, • OHIO

Heads of Foundries HAVE UNUSUALLY

AS EASY AS THIS to decrease scab charges at once and assure better castings — when you use Famous Cornell Cupola Flux.

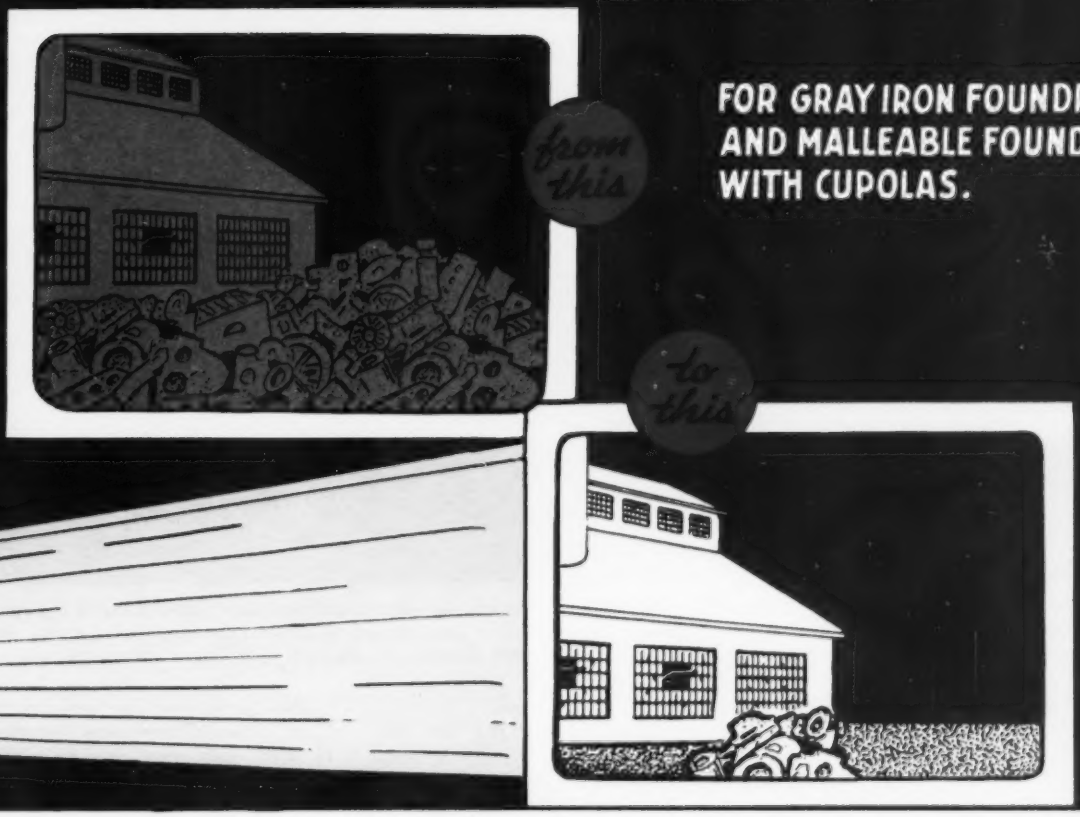


Famous CORNELL CUPOLA FLUX

LOW CASTING SCRAP LOSS

Famous CORNELL CUPOLA FLUX

CHANGES THE PICTURE



FOR GRAY IRON FOUNDRIES AND MALLEABLE FOUNDRIES WITH CUPOLAS.

FAMOUS CORNELL CUPOLA FLUX conditions iron for better castings and greatly reduced scrap loss by cleansing it of impurities and increasing fluidity. Sulphur is greatly reduced and slag is kept fluid.

REDUCES CUPOLA MAINTENANCE, TOO. Drops are cleaner, bridging over is practically eliminated, and the formation of a glazed or vitrified protective surface on cupola lining reduces erosion and repairs.

PRE-MEASURED SCORED BRICK FORM makes labor in using practically nil, promotes greater accuracy and reduces waste.

WRITE FOR BULLETIN No. 46-B

The Cleveland Flux Co.

1026-1040 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes – Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

BRASS FLUX

FAMOUS CORNELL BRASS FLUX cleanses molten brass even when the dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

ALUMINUM FLUX

FAMOUS CORNELL ALUMINUM FLUX cleanses molten aluminum so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive formula reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.

Chapter News

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Western New York

A. A. Diebold
Atlas Steel Casting Co.
O. V. Guenther
State University of New York

With visitors from many parts of New York, Pennsylvania, Ohio, and Michigan, Western New York Chapter's Educational Committee, under Alfred A. Diebold, Chairman, held a Shell Molding Educational Program in March at the Buffalo State Technical Institute, in Buffalo. A total of 535 persons attended duplicate afternoon and evening sessions.

Mr. Frank W. Less, development engineer at Durez Plastics and Chemical Corp., North Tonawanda, N. Y., was the main speaker at both sessions. Discussing shell mold resins and sand characteristics, Mr. Less pointed out the various methods used for mold assembly and set-up for pouring. He concluded that, in all large scale production at present, it has proved best and most economical to clip the edges with inexpensive, one trip, spring wire clips and back up with shot or coarse dry sand.

Other speakers included Charles O. Bueg of the Arrow Pattern Works, Erie, Pa., whose topic was materials construction and costs of shell mold patterns; and Ray Sutter of Sutter Products Co., Dearborn, Mich., who used slides to illustrate his talk on shell mold production equipment. Otto W. Winter of the Winter Engineering Corp. spoke on the design of automatic shell mold equipment produced by his organization.

Following the showing of two industrial motion pictures, a demonstration of the making of shell molds and their pouring was staged by Mr. E. Roeck of the Durez Plastics and Chemical Corp., and David Stein of the Samuel Greenfield Co. Many fine comments were made by members and guests regarding the exhibit of shell molds and castings shown by seven companies of the area.

Detroit

Walter P. Kantzler
Kelsey-Hayes Wheel Co.

Over 100 foundrymen and their sons attended a special father-and-son meeting of the Detroit Chapter recently. They heard L. D. Richardson, Eutectic Welding Alloys Corp., discuss *"Application of Low-Melting Non-Fusion Filler Metals in Operations."*

After presenting a short historical background of the role that welding has played in the foundry industry, Mr. Richardson stated that the low-melting, non-fusion type of welding alloys have the following advantages: they have no porosity, do not undercut match base metal, and offer over 200 alloys designed for varied applications. The speaker described two electrodes that are widely used in the foundry. One type is used as a cutting agent for all alloys. It has a special metal core covered with a rare-earth, metal-base flux which burns to a high velocity gas. The second type is used to remove cracks and defects in castings without any further preparation for welding. It can remove up to 50 lb of metal per hour. Both of these electrodes do not put any heat in the base metal and do not contaminate.

Mr. Richardson then spoke of the various techniques used in welding grey cast iron, malleable iron, pearlitic malleable and nodular iron. Slides were then shown which illustrated repair work on tools, castings, etc.

Harry Gravlin, Ford Motor Company, Detroit, presented Mr. Richardson with a set of book-ends on behalf of the Chapter in appreciation of an excellent discussion.

Southern California

K. F. Sheckler
Calmo Engineering Co.

The Southern California Chapter held its February meeting at the Roger Young Auditorium. Approximately 120 members and guests attended.

Following a welcoming address by Chapter President Harold Pagenkopp, Angelus Pattern Works, Huntington Park, Calif., Bruce Farrow, Snyder Foundry Supply Co., Los Angeles, reported that chapter membership had reached a total of 300 with only seven to go to make the year's quota.

The speaker of the evening was C. A. McKeand, Merchants and Manufacturers Association, whose topic was *"Swallow Your Pride and Make a Profit."* He pointed out that many men who advance in responsibility and authority cease to consider the ideas of their subordinates on the theory that they are now "boss" and "know all the answers".

Employers, Mr. McKeand asserted should always consider the three basic motivating urges which are found in everyone to a greater or lesser degree: (1) desire for recognition and acceptance, (2) desire to improve one's status, (3) hunger for human affection. Only through proper communication with employees can these fundamental goals be achieved.

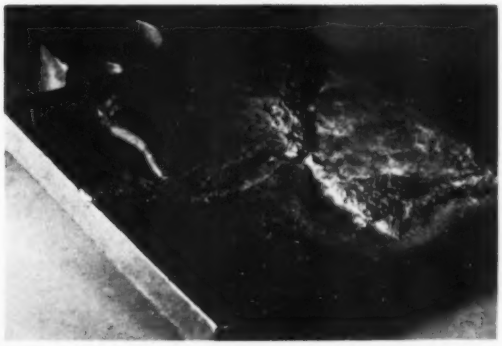
Continued on page 186

These photos show the members and guests of Western New York Chapter who attended the Shell Molding Educational Program at the Buffalo Technical Institute, Buffalo, N. Y. in March. Several foundry companies participated in the exhibit which was staged in conjunction with the program. Over 500 persons attended the afternoon and evening sessions.

VOLCLAY BENTONITE

NEWS LETTER No. 32

REPORTING NEWS AND DEVELOPMENTS IN THE FOUNDRY USE OF BENTONITE



Buckles

The "buckle" appears as one or more long, wavy depressions. Some believe it is between the beginning of a scab and the ending of a rat-tail. The basic weakness of the mold-metal interface is a spall. A slip plane has developed in compression thus forcing a depression into the casting while it is liquid. "Buckles" usually are associated with larger, heavier, and flatter castings. This, or these, rough irregular projections on the casting surface generally contain loose adhering molding sand.

The molding sand does not become encased, or impregnated with metal to the degree of a scab, as it is generally easily removed which usually leaves behind a smooth depression in the casting.

Often it is called a "blind scab," a "ram scab," a "scab-buckle," or a "cope pull-down."

The same causes that produce rat-tails also produce buckles and scabs, but the degree of the depression genally advances with the section thickness of the casting.

The most common cause of these depression defects is high sand expansion combined with high hot compression strength.

Improper gating can quickly produce this type of defect, particularly if a local hot spot is created, or the flow of metal develops expansion stresses at angles to "force in" the mold wall.

Photo Courtesy of: Bradley H. Booth

Any ramming greater than a green mold hardness of 60 tends to encourage these defects. Uneven ramming at the mold surface may rapidly create these defects if a sand mixture is prone to this condition. Hard ramming close to the pattern aggravates buckles and tends to increase them in depth.

Slicking of the mold is a common contributor to such defects.

Slow pouring and high temperatures are contributors. High molding sand density at the mold-metal interface which results in low permeability are factors in promoting buckles.

THE REMEDY—Insure against these expansion defects **by using approximately 1% by weight Five Star Wood Flour. Increase the green compression strength** to approximately 9 p.s.i. by A.F.S. Standards. Panther Creek Southern Bentonite is less apt to promote expansion defects than other bonds. Decrease the moisture if possible, **decrease ramming,** and **avoid metal turbulence.**

AMERICAN COLLOID COMPANY

CHICAGO 54, ILLINOIS

Producers of Volclay and Panther Creek Bentonite

Chapter News

continued from page 184

Central Indiana

W. H. Faust
Electric Steel Casting Co.

Stressing the versatility of shell molding in foundry operations, Richard Herold, Manager, Foundry Products Department, The Borden Company, was guest speaker at the March meeting of the Central Indiana Chapter. His subject for the session was *"Shell Molding and Resin Binders."*

Mr. Herold pointed out that shell molding has been successfully incorporated as an integral part of large castings where critical dimensions must be maintained in some areas. Shell molding, Mr. Herold noted, has proved feasible with all cast metals with the possible exception of low carbon steels. Other advantages of the process were listed as: reduced floor area for production, less sand consumption, reduced machining costs, and cleaner foundries.

A question session followed the feature speaker, mediated by Fred Carl of General Motors' Fabricast Division, who was Technical Chairman for the meeting. The discussion was concerned primarily with the blending of sands and the use of resin.

Missouri School of Mines

Sid Cole

The March session of the Missouri School of Mines Student Chapter featured R. H. Jacoby of the Key Co. in St. Louis as the main speaker. He discussed *"The Opportunities of Graduate Engineers in Industry,"* delivering an informative and inspiring message to the undergraduates.

The chapter is continuing a vigorous membership drive and is seeking to enroll every student in the school who is considering the foundry as a career. Morale of the members was raised considerably at the March meeting by the presence of several practicing foundrymen from the St. Louis area.

Western Michigan

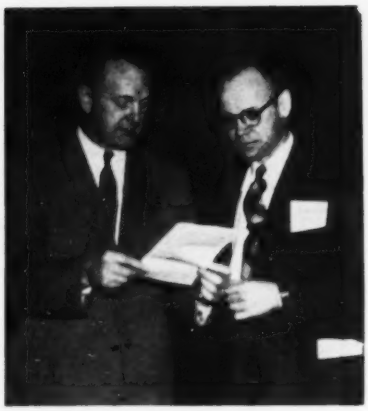
H. J. Mackay
Mackay Industrial Sales

An overflow crowd of about 155 persons attended the March meeting of the Western Michigan Chapter, held at Grand Rapids' Morton Hotel. The meeting featured split sessions, with separate programs for the ferrous and non-ferrous groups.

William Romanoff, H. Kramer & Co., addressed the non-ferrous members, taking as his topic: *"Brass and Bronze Foundry Practice."* Technical chairman for this meeting was Fred Papke, Wolverine Brass Co.

"The Invisible Shield," a sound motion picture in color was shown for the other members and guests. This film, presented by the Claude B. Schneible Co., shows the entire cycle of processes involved in modern foundry operations.

continued on page 189



Luncheon speakers comparing notes at Wisconsin Regional are George Dreher (left), Foundry Educational Foundation, Cleveland, and Herbert F. Scobie, technical editor of *American Foundryman*.

Wisconsin Regional Conference

Opening 16th annual Wisconsin Regional Foundry Conference, Chapter President J. G. Risney, Risney Foundry Equipment Co., Wauwatosa, Wis., is flanked by (l to r) W. F. Scholtz, Allis-Chalmers Mfg. Co., Milwaukee; Dean M. O. Withey, University of Wisconsin, and National A.F.S. President I. R. Wagner.

Registration time at the Wisconsin Regional Conference found Chapter Treasurer L. J. Gratz, G & O Pattern Works, and Ticket-Sales Chairman S. E. Shaver, Archer-Daniels-Midland Co., both of Milwaukee, hard at work.

Posed for snapshot during Wisconsin Regional Conference are A. F. Pfeiffer, (left), Allis-Chalmers Mfg. Co., West Allis, Wis., and Guest Speaker Edward McFaul, Mid-West Institute, Chicago.

Free Information

continued from page 34

for further data, use postcard, p. 34

59. Shell Molding Resins

Booklet (9-52) contains basic information concerning the principles involved in making shell molds, the merits of the process, and the equipment and materials used. Discusses patterns, sands, binders on basis of laboratory-controlled experiments. *Plastics Engineering Co.*

60. Compressed Air Filter

Illustrated bulletin covers construction features and gives technical data and dimensions of a new disposable filter cartridge designed to provide "instrument-quality" air for all compressed air applications with ordinary plant air as its only source. *Nankison Corp.*

61. Pyrometers

Two-color booklet (GEC-713B) describes complete line of indicating and controlling pyrometers. Gives design features, applications, operation, functional principles, construction and specifications. Also contains information on other temperature equipment —thermocouple components and accessories, hand pyrometers, thermocouple potentiometers, resistance thermometers, and resistance bulbs. *General Electric Co.*

62. Bronze Welding Alloys

Chemical and physical properties of line of bronze welding alloys are outlined and discussed in six-page folder. Lists ASTM, AWS, Federal and Navy specifications which alloys will meet. Describes "double-deoxidation process" which promotes uniformity of mixtures, increased ductility, sound, dense deposits, and reduced fuming. *Titan Metal Manufacturing Co.*

63. Heat Treating Furnaces

Six-page, gatefold bulletin (HT-53) describes complete line of heat-treating furnaces and ovens for annealing, tempering, stress relief, holding, aging, billet heating, etc. Illustrated with photographs and diagrams, folder shows actual installations of car-bottom, batch, conveyor, and special type furnaces. *Carl Mayer Corp.*

64. Roller Chains and Sprockets

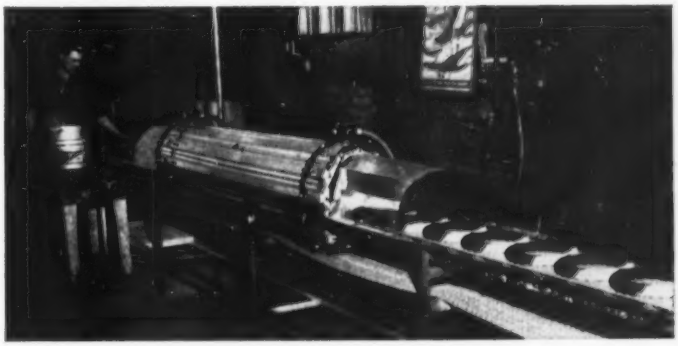
Comprehensive 54-page bulletin (#52-1) lists all standard-size roller chains and presents treatise on how to make proper selection—with formulas, tables and examples. Stock sprockets (their characteristics and prices) as well as bore, keyway and setscrew are also described. Book also reviews proper maintenance of chain drives and provides information on chain vises, flexible couplings and coupling covers. *Chain Belt Co.*

65. Standard Alloys

Pocket-size booklet describes standard line of alloys produced for use in ferrous and non-ferrous foundries. Gives details of service offered by research and production departments in producing special alloys to meet individual specifications. Booklet also contains handy guides as to melting points of metallic elements, density and weight of various materials, metric and temperature conversion and other helpful data. *Alter Co.*

Another CHROMALOX Production Tip

Core Drying Time Cut from 24 HOURS to 6 SECONDS!



PROBLEM

To speed up the drying of the dip-coat applied to cores for casting automotive parts. At least 24 hours drying time was needed under old method, and 6000 square feet of valuable floor area was used to store the cores while they air dried.

SOLUTION

The foundry installed a compact far-infrared core drying oven made of eleven 3.6 kilowatt all-metal Chromalox Electric Radiant Heaters. A 15-foot conveyor belt, variable in speed from zero to 10 feet-per-minute, moves cores through the oven at rate of 600 to 800 per hour. Cores are thoroughly dry in 6 seconds and ready for assembly.

ADVANTAGES

1—Drying time reduced from 24 hours to 6 seconds! 2—Existing core drying area including oven occupies only 200 square feet against 6000 square feet the old way. 3—Core surfaces are smooth and bubble-free with rejects practically eliminated.

CHROMALOX
Electric Heat for Modern Foundries

Want to know more about cutting costs with CHROMALOX heat?

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7609 Thomas Blvd., Pittsburgh 8, Pa.
Send me more details on Chromalox Electric Heat for

☐ Shell molding ☐ Core drying
☐ Skin drying of molds ☐ Comfort heating

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Company
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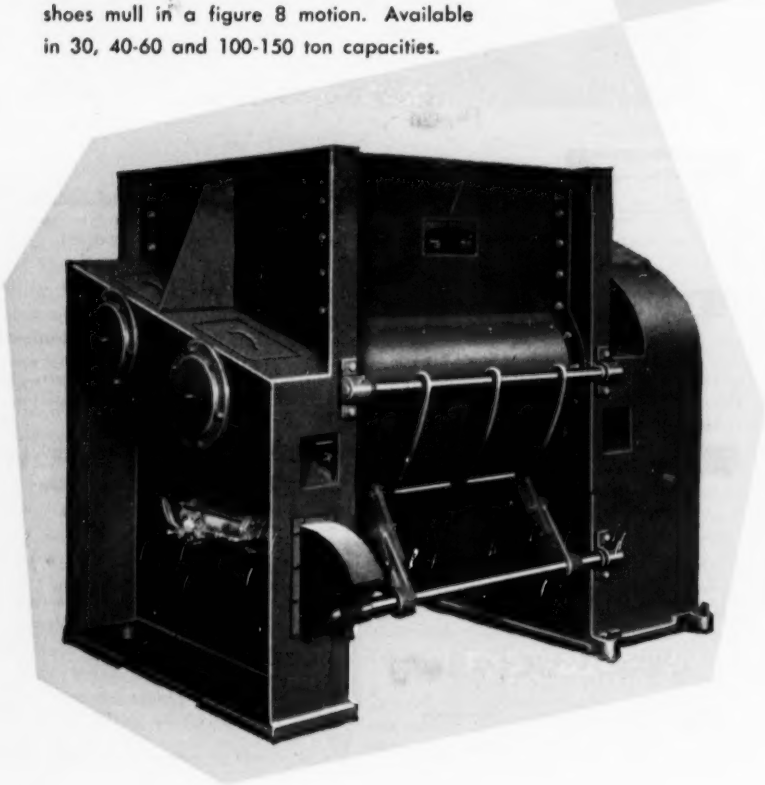
Two Baker Perkins sand handling units that help to improve casting quality

Baker Perkins No. 5A Continuous Muller

Baker Perkins No. 5A Continuous Mullers are helping to produce better castings in many large foundries because they get used sand in proper condition for re-use. They will mull up to 100 to 150 tons of core sand per hour on a continuous production schedule. Cast steel sigma type blades with renewable shoes mull in a figure 8 motion. Available in 30, 40-60 and 100-150 ton capacities.



Baker Perkins Unidor Core Sand Mixers

In smaller foundries these batch type mixers can help improve the core sand and thus give better casting quality. They rub, stir and knead all in one operation, distributing a thin layer of bond around each grain to assure 100% benefit from bonds, oils, binders and other compounds. Available in 5½ to 35 cu. ft. working capacities.

BAKER PERKINS INC.
FOUNDRY EQUIPMENT SALES
SAGINAW, MICHIGAN

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Chapter News

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Quad-City

ERIC WELANDER
Deere & Co.

"Shell Molding" was the subject of a speech delivered by Walter Sokolosky, foundry service engineer for Monsanto Chemical Co., to a large audience at the Fort Armstrong Hotel, Rock Island, Ill. The venting of gases and the problems of warpage in shells were among the topics discussed. Use of resin coated sands in the production of shell cores was described in considerable detail. A question and answer period followed the formal speech. Ted Burkland of Deere & Co. presided as technical chairman for the meeting.

Ontario

FRED J. RUTHERFORD
Refractories Engineering & Supplies, Ltd.

The first Brantford meeting in the history of the Ontario Chapter attracted one of the largest attendances on record.

Highlight of the evening was the award of three 50-year service pins. These went to Robert Holland, Dominion Wheel, Cobourg, for 57 years service; and to H. Boulton, Waterous, Ltd., Brantford, and B. Hendershott, Massey-Harris, Brantford, each with 52 years in the foundry industry.

About 100 members took advantage of invitations to an afternoon tour of two of the most modern production foundries in Canada—Cockshutt Farm Equipment Ltd., and "M" Foundry of Massey-Harris Co., Ltd.

"Non-Destructive Testing as a Foundry Tool" was the subject of the evening address by John Anspach, Mechanite Metal Corp., New Rochelle, N. Y., before the Ferrous Group Meeting, one of the two after-dinner technical sessions. The Non-Ferrous session heard a panel discussion on patterns. Panel members were John McRoberts, Hamilton Match Plate Co., Hamilton; Ted Robinson, John Bertram & Sons Co., Ltd., Dundas; Les Bland, Neptune Meters Ltd., Toronto; Fred Bowery, Massey-Harris Co. Ltd., Brantford; George Bott, Welland Electric Steel Foundry, Welland. Tom Myatt, Toronto Pattern Works, Toronto, served as chairman and discussion leader.

Mr. Anspach urged the use of some form of non-destructive testing as a means toward producing sound castings. He gave figures which showed that a high percentage of castings proved to be faulty only after expensive machining operations by customers revealed internal cracks, porosity, segregation, etc.

This, the speaker said, reflected badly on the foundry industry. One result was that weldments and forgings were replacing a lot of machined parts that formerly were cast.

To build and hold a large volume of casting business, Mr. Anspach said, it is becoming necessary to guarantee consistent quality production before a customer will buy. Manufacturers are demanding more stringent control of their products in order to meet more exacting specifications.

The speaker described, with the aid of slides, the four major means of nondestructive testing: radiography, ultrasonic, magnuflux and penetrant methods.

Foundrymen were urged particularly to investigate cobalt 60, a radioisotope used for non-destructive testing recently made available to industry at low cost by the government. Installation of cobalt 60, the speaker said, probably would fall within the capital budget of any foundry and represented the lowest capital expenditure of any of the four methods of non-destructive testing.

In the panel discussion on patterns, there was sharp discussion on the subject of linear shrinkage. Some felt that methods of molding, types of gates and position of risers influenced the amount of shrinkage from pattern to casting stage. Mr. Bott read a short paper, by way of introducing, outlining the functions and describing desirable features which would be incorporated in making a good pattern. He showed the necessary gates, core prints and feeders for producing a good steel casting.

Mr. Bowery gave an outline of his company's procedure before a match plate production pattern was made. Five department supervisors—pattern, engineer, metallurgy, foundry and cost—are involved in deliberations to ensure that the pattern will produce castings successfully and economically.

Mr. McRoberts, talking on desirable features in match plate patterns, said that quite often the necessary space between patterns and flask received second consideration in an effort to get as many patterns on the plate as possible. Ample room should be provided around the projection of an upset plate to clear sand strips, he said. Neglect of those two features was a common cause of run-outs and crushes.

The February meeting of the Ontario Chapter chalked up another record attendance. More than 200 members turned out to hear S. C. Massari, Technical Director of A.F.S.

Members were favorably impressed by the fact that much of the work and direction in preparation of this film had been done by Mr. Massari and that such research projects are a direct result of their membership in the Society.

Chapter Chairman, A. Reyburn, Cockshutt Farm Equipment, Ltd., Brantford, presided and Jack King, Archer-Daniels-Midland Co. Toronto, introduced Mr. Massari.

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Edwin S. Lawrence, General Electric Co., Schenectady, N. Y., outlines results of Eastern New York foundry manpower survey. Seated, left to right, are: James Allgeier, Troy School System; Ray E. Ellis, General Electric Co.; Wm. N. Fenninger, N. Y. State Education Dept.; and Dr. Allen K. Booth, Tri-City War Manpower Comm.

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Rue Paul Carle, Seine, France

continued from page 189

Central New York

HAROLD BRAKEMAN

The progressive Central New York Chapter introduced a new innovation for A.F.S. with the formation of a Past Chairmen's Club. Marty O'Brien, national director for the area, presented plaques to past chairmen at the March meeting. As pointed out by William Dunn, the new Club offers an opportunity for past officers to continue their active participation in chapter operations.

The 90 members and guests split into two groups for the technical discussion. The patternmakers held a round table discussion on common problems. The other group heard Michael Bock, vice president of Exomet, Inc., present an illustrated lecture on the use of insulating and exothermic materials as aids to better feeding. Mr. Bock maintained that by adding heat to a riser to make it cool slower, sounder castings would result and often a smaller riser could be used. Slides were used to show that apparently sound, fine grained castings that have been micrographed may actually prove to be porous if x-rayed. Use of exothermic sleeves for insulating risers has proved very effective, said Mr. Bock.

Chicago Chapter foundrymen heard Earl Shaner, Penton Publishing Co., Cleveland, at their March meeting. Left to right, are: John A. Rassenfoss, American Steel Foundries, East Chicago, Ind.; John H. Owen, Harbison Walker Refractories Co., Chicago; Fred B. Skeates, Link-Belt Co., Chicago; Mr. Shaner and Robert L. Doelman, Miller & Co., Chicago. Photo courtesy I. H. Dennen, Beardsley & Piper Div., Pettibone Mulliken Corp.

Central New York Chapter inaugurated a new Past Chairmen's Club at the March meeting, which honored these ex-officers: (front, l. to r.) J. Livingston, F. Wheeler, H. Boardman, C. Fletcher; (rear row) D. Minncar, L. Wright, D. Dudgeon, W. Dunn, L. Hall, E. White. H. Judson and E. Hook, both former presidents, were absent.

St. Louis District

FRED J. BOENEKER
Bronze Alloys Co.

More than 150 members and guests attended the March meeting of the St. Louis District Chapter and were given graphic proof of the steps taken by the group to encourage the development of new skilled journeymen in the area. E. R. Belton, Progressive Pattern Co., presented winners and their entries in wood patterns, metal patterns and molding categories. Following this presentation, F. W. Burgdorfer, dynamic Chairman of the St. Louis Pattern-makers Joint Apprenticeship Committee, awarded certificates of completion of the 5 year apprenticeship course to: Alfred M. Sandweg, Matt Pattern Co.; Raymond C. Kastrup, Consolidated Pattern & Mfg. Co.; and Robert R. Barcheck, Nordberg Mfg. Co. The benefits of Apprentice Training to both the trainees and the industry were further outlined in short talks by

continued on page 192

Chicago

Windy City foundrymen journeyed to the south side of Chicago for their March 2 meeting to hear Earl Shaner, Penton Publishing Co., Cleveland, deliver a Management Night address entitled *"Post-Election Problems Facing the Administration."*

John H. Owen, Harbison Walker Refractories Co., presiding, called on Fred B. Skeates, Link-Belt Co., to comment on 1953 Convention committee activities which the latter heads. Mr. Skeates invited Chicago foundrymen to throw their plants open to visitors during Convention Week and to show "everything."

One of the problems of the administration in Washington, D. C., said Mr. Shaner, is to stabilize the country's economy without bringing on a depression. He said the administration is trying to reduce the size of government as an economy measure. Another advance, he declared, is the greater initiative being given business.

The high proportion of businessmen in the new government, Mr. Shaner stated, is a challenge to business to show by deeds the advantages of the capitalistic system.

Chapter News

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M. Reed Bass of the David Rankin Trade School in St. Louis, C. E. Rutledge of the U. S. Labor Department, and R. W. Schroeder of University of Illinois' Navy Pier, Chicago, Chairman of the A.F.S. Apprentice Contest Committee.

Chapter Chairman Henry W. Meyer, General Steel Castings Co., introduced the principal speaker, William Ball of Chicago's R. Lavin & Sons. Mr. Ball's topic was *"Human Engineering,"* a subject of continuing importance to foundrymen. His discussion brought repeated applause, particularly in reference to the spiritual aspect of management-labor relations as applied to the foundry industry.

J. H. King, left, spoke to the March meeting of Rochester Chapter. He is shown here with Andy Coulter. Both men are affiliated with Archer-Daniels-Midland & Co.

Rochester

H. G. Stellwagen
Hetzler Foundries, Inc.

The core problem is the correlation of improved relation of materials and the mechanics of mixing core sand, Mr. J. H. King, Archer-Daniels-Midland Co., told the March meeting of the Rochester Chapter of A.F.S. Mr. King discussed the mixing of core sands at length, describing the proper methods of blending and the adding of binders. Much valuable practical information on working foundry practice was made available to the audience, which included Thomas Boyd of Medinah Iron & Brass Co., and Karl C. Gruber, General Railway Signal Co., each of whom has served more than 50 years in the industry.

Three young men who have completed Patternmaking Apprenticeship Training and earned the right to wear the "Journeyman's Apron" were honored at the March meeting of the St. Louis District Chapter. (l. to r.) C. E. Rutledge, U. S. Labor Dept.; F. W. Burgdorfer, Chairman St. Louis Patternmakers Joint Apprenticeship Committee, Journeyman Patternmaker Alfred M. Sandweg; R. W. Schroeder, Chairman A.F.S. National Apprentice Contest Committee; Journeyman Patternmaker R. C. Kastrup; E. R. Belton, Apprentice Training Chairman, St. Louis District; Journeyman Patternmaker R. C. Barcheck; and M. Reed Bass of David Rankin School, St. Louis.

An arc welding demonstration featured the Michigan State Student Chapter meeting for March. L. H. Richardson, shown during the demonstration, directed the program.

Michigan State Student Chapter

Bruce L. Harding

This active student chapter staged an arc welding demonstration, hosting the other student engineering societies on campus, and the local men in the welding business. The demonstrator was L. D. Richardson, Eutectic Welding Alloys Corp.

Mr. Richardson welded brass and aluminum, built up gear teeth on plain bar stock, welded tool steel rod onto soft steel shank to form a tool bit, and welded stainless steel to cast iron. Richardson also demonstrated his com-

continued on page 208

Quick...

Reference and Application

TO PATTERN SHOP PRACTICE

Patternmaking, today, is an all important factor in efficient manufacture of all types of machinery for modern industry

A patternmaker must be readily able to read a drawing, sketch or blueprint correctly, and then visualize the finished product. He must have a comprehensive knowledge of foundry methods and techniques in order to efficiently construct the pattern to required specifications.

It was to meet the demands of the foundry industry for sufficient and authentic material for in-service training of the apprentice, as well as a source of quick reference for the trained mechanic, that the new **PATTERNMAKER MANUAL** was completed under direction of the A.F.S. Pattern Division.

Typical pattern problems are included in this First Edition of a 288-page, case-bound book that deals exclusively with basic principles that are generally applicable to the manufacture of most types of patterns.

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Rules, tables and technical data have been carefully assembled to make available the type of information that will be of vital help to all phases of patternmaking.

PATTERNMAKER'S MANUAL represents original contributions from men in every branch of the foundry industry . . . from Master Patternmakers, in U. S. Naval Shipyards, as well as leaders in private enterprise — their thinking is combined in this new book, now available.

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Letters

Continued from page 172

orientation curriculum in an endeavor to stimulate the student's choice of a field. Everything is done to help the student to choose a field in which he will be successful scholastically.

Want Report Writers

Mr. Brown states that a contributing factor toward success is the ability to express oneself both orally and in writing. With this I agree, but he is not alone in his desire for such men. Practically every company representative who interviews our men, when asked what should be emphasized in the engineering curricula, will say: "Teach your men to write reports."

All our students are required to take six credits in English, and must pass a proficiency test in English before they can graduate. Many engineering schools throughout the country have such a requirement. Engineering students also take a course in Engineering Reports, and have a minimum of four laboratory courses in which reports are required and graded for presentation, English, and technical content.

The basis for the Engineering Reports course is a survey of some 50 companies throughout the country, which were asked to state the deficiencies in report writing among engineering graduates they employed. In several cases, the questionnaire was reproduced and circulated to different departments and divisions of the company. Prof. T. A. Sherman of our English Department will be glad to receive any ideas on report writing that Mr. Brown may care to offer.

Each engineering curriculum here has a Pro-seminar course in which students are instructed in public speaking. They are required to give five-minute talks based on articles in the technical literature and must answer questions for five minutes thereafter. In addition, they must prepare a semi-technical article (some of which are used in our quarterly publication, *The Idaho Engineer* and must give a 15-minute talk based on the article, answering questions for 10 mintues afterward.

Learn Public Speaking

The class is conducted in a manner similar to a technical society meeting. Each man takes his turn as chairman and time keeper. The better speakers represent the university at the Northwest Student Regional Conference of ASME. Similar speaking contests are sponsored by the local sections of ASME and SAE.

The man who stated that many students are deficient in English when they enter college is, in my opinion, correct. Many state colleges and universities are required to admit students with a high school diploma. No school can "bat" 100 per cent but companies expecting all graduates to be "straight A" students expect too much.

Nearly every company that visits our campus asks to interview "the top 10 per cent." My own reaction to this is that any student who can qualify for graduation has earned our recommendation. If we cannot recommend him, he should not have graduated.

Keeps Industrial Outlook

Having been connected with the foundry industry for over 20 years before teaching, I still have somewhat of an industrial outlook. To me, the institutions of higher education which teach engineering are producers, and industry is the consumer. If the quality of our product deteriorates, we can expect to lose to competitors.

The statement attributed to a professor that college is "a place for kids to grow up," reflects some modern philosophy. Students do grow up in college; they would grow up if not in college, but in college they mature—not fully, of course, but the process has begun.

Specialization can be carried too far. We have five recognized and accredited engineering curricula—agricultural, chemical, civil, electrical and mechanical—with no options for specialization. We believe in thorough grounding in engineering "fundamentals," with as much time for cultural subjects as possible.

Mr. Brown uses the words "basic technical knowledge" and "fundamentals." What is a "fundamental"? My own opinion is that fundamentals are the ultimate relations which basic research seeks. If this were not so, there would be no reason for basic research.

English Is Fundamental

Fundamentals are the useful relations that can be applied in a specific field, and English is one. When Mr. Brown graduated from high school, did his vocabulary include all the words and shades of meaning that it does today? Did it contain all the technical terms, and a knowledge and meaning of them, when he graduated from college? Certainly he could not know the useful shop slang that he has accumulated since.

No engineering curriculum is accredited by the Engineering Council for Professional Development if it does not contain a minimum of 15 percent of its graduation requirements in cultural subjects. As Mr. Brown infers that many schools do not require such courses, he must have been contacting non-accredited institutions.

There is an old adage that "you cannot have your cake and eat it." The various fields of engineering are

continued on page 197

One of the ways engineering students are trained to take a place in a commercial foundry after graduation is through advanced foundry instruction such as is taught at Purdue University. At Purdue, mechanical engineers take an intensive summer course, producing castings and studying design from the standpoint of economical production. Also covered is design of a production system to supply a given casting requirement. At a time when the problem is well understood and plans begin to crystallize in the student's mind, they visit a foundry such as (in 1952) the Central Foundry Div., GMC, Danville, Ill.

Foundrymen

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Robert H. Zoller

Robert H. Zoller, head of Zoller Casting Co., Bettsville, Ohio was elected president of the newly formed Melting Research, Inc., also at Bettsville. Before building the gray iron foundry which carries his name, he was superintendent of melting operations at Central Foundries, Saginaw (Mich.) Div., General Motors. Prior to that he was melting metallurgist at Valley Steel Casting Co., Bay City, Mich., and previous to that chemist and melter at Wehr Steel Co., Milwaukee, Wis. Mr. Zoller has served three years on A.F.S. Refractory Committee.

Frank J. Sherwin has been elected president, Chicago Hardware Foundry Co., North Chicago, Ill., succeeding his brother, the late Edward B. Sherwin. Frank Sherwin joined the company in 1915. After positions as plant engineer and manager, he became vice-president-sales for the foundry division, following the death of his father, John Sherwin, who was first company president and one of its founders.

Henry H. Macler has been named vice president-general manager, Drake Manufacturing Co., Friendship, N. Y. Mr. Macler began his career with Singer Manufacturing Co., Elizabeth, N. J. first as foundry metallurgist and later assistant to the foundry manager. In 1946 he joined Sterling Foundry Co., Wellington, Ohio, as foundry engineer and since 1948 had been general superintendent there.

F. Dier Ticknell has been elected treasurer of Chain Belt Co., Milwaukee. He succeeds **George M. Dyke** who has retired after 30 years of service. **John Sutcliffe** has been appointed personnel manager of the Milwaukee works.

The Cast Iron Soil Pipe Institute, New York, has elected **J. W. Struve,** Rich Manufacturing Co., Los Angeles, president. Also elected were **Frank Hamilton,** Anniston Soil Pipe Co., Anniston, Ala., vice-president; and **Deems W. Hallman,** Hajoca Corp., Philadelphia, treasurer. Named to the executive committee were J. W. Struve, Charles Hamilton, Alabama Pipe Co., and **William C. Baird,** Buffalo Pipe & Foundry Corp., Buffalo, N. Y.

Henry F. Arndt has been named chief engineer of the Detroit Electric Furnace Div., Kuhlman Electric Co. He replaces Charles V. Kilburn who resigned to join Essex Wire Corp. **Joseph P. Przygocki** has been assigned production and control functions for Kuhlman's DEF Div.

Lewis D. Reiff

Lewis D. Reiff, formerly assistant general manager, has been promoted to vice president-steel foundry operations, at Superior Steel & Malleable Castings Co., Benton Harbor. Mr. Reiff joined SS&MC in 1944 as a special assistant. Previous to that he was with Buckeye Steel Castings Co., Columbus, Ohio, and American Steel Foundries. **P. Richmond Schilling,** formerly assistant to the president, has been named vice president-malleable foundry operations. He joined SS&MC in 1937. He was formerly with Malleable Founders' Society, Cleveland, and Pratt & Letchworth Co., Buffalo, N. Y.

Arthur R. Cahill was elected assistant treasurer of International Minerals & Chemical Corp., Chicago, at a recent board of directors' meeting. He will be on the staff of Robert P. Resch, vice-president and treasurer of IM&CC.

Directors of National Lead Co., New York, have made **R. J. Koegler** a vice-president of the company and general manager of its newly-formed Doehler-Jarvic Div. He will direct National's operations in die casting.

Achille Constant Louis Alfred Brizon has been selected vice-president of the International Committee of Foundry Technical Associations for 1953. Founder and manager of Fonderie A Brizon at Courberoie (Seine), France, he produces pressurized casting. Mr. Brizone was president of the International Committee in 1937-38, presiding at the International Congress held in Paris in 1937. He has represented France as an official delegate at numerous "Internationals", and last October headed the French productivity mission of pressure-cast foundrymen to the United States. He will act as International vice-president at the Paris Congress this September, which will be presided over by International president **L. N. Shannon,** Stockham Valves & Fittings, Birmingham, Ala.

American Wheelabrator & Equipment Corp., Mishawaka, Ind., has promoted **K. E. Blessing** district manager of its Hoboken, N. J. office and **F. John Pichard** sales engineer. **George F. Burditt** is the new district manager of the Pittsburgh office, and **C. E. Andrews,** service engineer there. **George C. Tolton,** formerly with the Seattle office, has been named district manager of the Greensboro, N. C. office.

P. Richmond Schilling

A new Non-Destructive Testing Dept., headed by **Alexander Gobus,** has been established by North American Philips Company, Inc., Mount Vernon, N. Y. The department will handle new research developments in the industrial x-ray field. Mr. Gobus had been with Sam Tour & Co., New York.

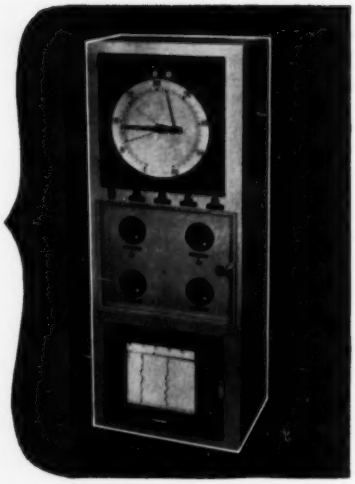
Rex Reeder, executive vice-president Marine National Bank, Milwaukee, has been elected to the Allis-Chalmers Manufacturing Co. board of directors. He is also a director of Charles A. Krause Milling Co.

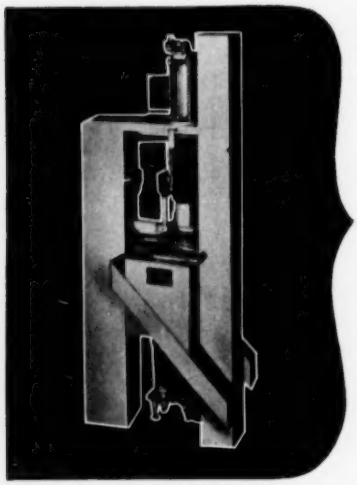
continued on page 202

DIETERT-DETROIT AUTOMATIC SAND CONTROL

WATERTEMP CONTROL

Eliminates Wet and Dry Batches
Positive Moisture Control
Minimizes Hot Sand Problem
Insures Uniform Mulling
In Step with Short Cycles
Adds Base Water to Temper
Adds Evaporation Water to Cool
Handles Slurry Effectively





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Free Information

continued from page 187

for further data, see postcard, pg. 34

66. X-ray Accessories

Complete listing of X-ray stocks and services is presented in catalog 404-000. Line includes industrial x-ray inspection equipment and radiography, fluoroscopy and photofluorography. Either stationary units for production line inspection or mobile units can be moved where inspection is required. *Westinghouse Electric Corporation.*

67. Desulphurization

"Advantages of Desulphurizing Molten Metal with Solvay Dense Soda Ash" is title which explains purpose of booklet which also explains in non-technical language, various methods of adding dense soda ash to molten metal. *Allied Chemical Co.*

68. Shell Molding

Booklet (Cat.-1-2M-1-53) describes shell molding machine and accessories. Gives complete specifications and illustrates some of the castings produced. *Shell Process, Inc.*

69. Reclaim Defective Castings

Eight-page folder describes new equipment for salvaging castings without setting up residual stresses and contraction resulting from high temperature welding. Dot-Weld Pistol is a high amperage, low voltage unit, with high pressure air quenching of electrode and arc. Air cylinder effects a vibrating action that makes and breaks the arc, resulting in metal "dotting." *Metallizing Company of America.*

70. Equipment and Services

Handbook titled "Whiting Products Serve All Industry" catalogues equipment and services the company offers to various industries. Divisions include aviation Swenson chemical-processing, materials handling and transportation equipment, engineering, metal-working machinery. Directors, officers, branch plants and district offices are also listed. *Whiting Corp.*

71. Back-up Material

Harrison Technical Bulletin No. 5 describes increasing use of metal shot as weighting or back-up material, particularly in shell molding. Contains several drawings and diagrams showing mold box cross sections and an experimental box used for testing back-up materials. One chart indicates pressures exerted by various back-up materials. *Metals Disintegrating Co.*

Letters

Continued from page 194

continually expanding. Knowledge in the fields also is increasing. New slants on the applications of "fundamentals" (there's that word again) are appearing. New phenomena are recorded almost daily. Every company wants some indication of the application of physical laws introduced to the students *involving his product.*

Since I graduated from a fine engineering school, I have seen great developments in mathematics, physics and chemistry—the so-called basic engineering sciences. There are recommendations that the minimum mathematics required for engineers be differential equations. Nuclear physics is new in Mr. Brown's time, the use of catalysts was hardly known when the writer went to school, and ion-exchange was not even thought of.

Vibrations is a rapidly developing field. Servo-mechanisms is the subject of many texts. In metallurgy, you have seen the growth of aluminum, magnesium and the so-called high temperature alloys for gas turbines—and these are only a few of the developments in fields with which the engineer should at least know about.

Look at Instructor's Problem

Add this new material to the curriculum which Mr. Brown had in school, and see what the job of the engineering instructor is today. Now add the cultural material. Obviously, a graduate will be "neither fish nor fowl" with equal emphasis on both technical and cultural subjects; something must be emphasized. In engineering, emphasis is on the technical with the cultural in the minor position; it cannot be otherwise.

Remembering that "a little knowledge can be a dangerous thing," I often wonder if it might not be well to omit the various cultural subjects from the engineering curricula and let experience stimulate the graduates to discover and study these fields. Thinking individuals will be stimulated to this course through their every-day experiences. And all engineering schools try to teach their students to think and analyze. These are some of the main goals of engineering instruction.

As for civic responsibilities, a large number of company executives are engineers and are called upon constantly for civic participation. To name just a few: Senator Flanders, Secretary of Defense Wilson, and Herbert Hoover. President Eisenhower also was exposed to engineering for West Point was the first institution of higher education in the United States to have an engineering curriculum.

The engineering profession has supplied many civic leaders, and I believe that it will continue to do so. Let us not try to make engineers all things to all people. Let them still be engineers and continue to "harness the forces of nature for the uses and conveniences of man."

PROF. N. F. HINDLE, *Head*
Mechanical Engineering Dept.
University of Idaho
Moscow, Idaho

Professor Hindle, known to many foundrymen, was formerly Technical Secretary of A.F.S. in Chicago.

Training Debate Continues

I am not an engineering graduate and therefore not as familiar with the problem as Hiram Brown is as shown in his article *"Are Technical Graduates Getting Adequate Training in College?"* (AMERICAN FOUNDRYMAN, September 1952, page 56). However, as I read the article recently, I could not help remembering the non-credit English course I was forced to take at Pur-

continued on page 199

3 IMPORTANT FEATURES of
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Swing Frame
GRINDERS

- **Perfect center balance** of wheel and motor ensures grinding ease and efficiency.
- **"Worker safety"** is carefully provided.
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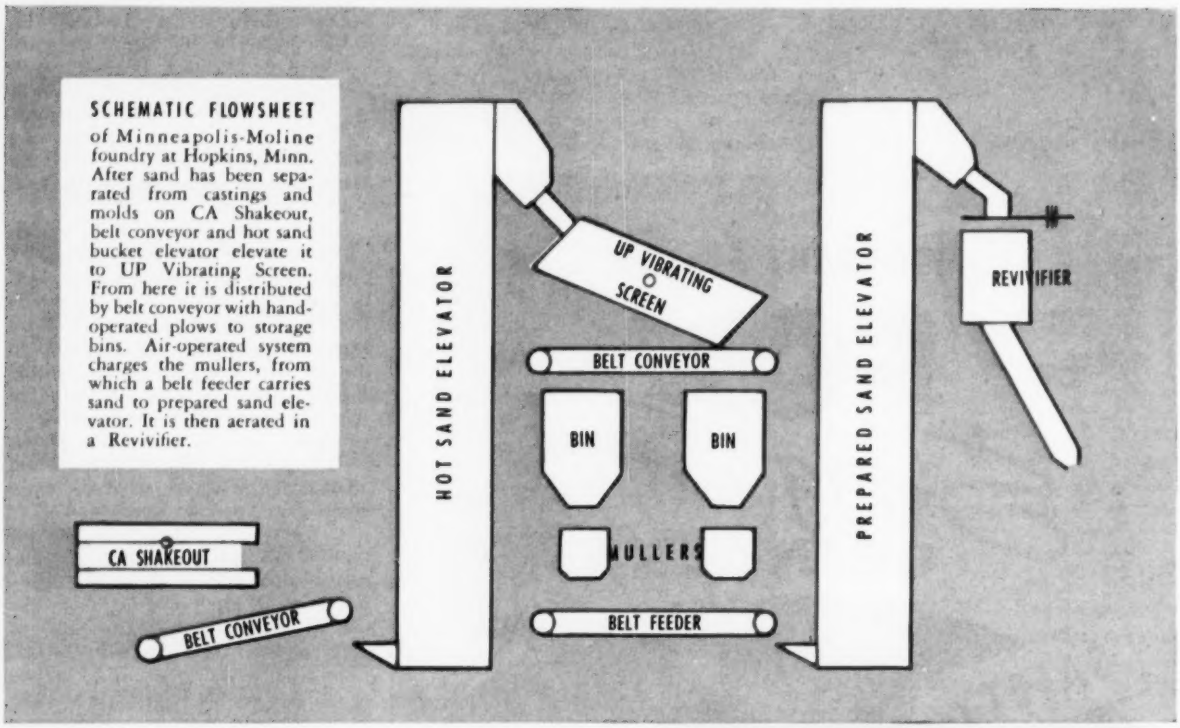
LINK-BELT mechanizes sand handling for Minneapolis-Moline

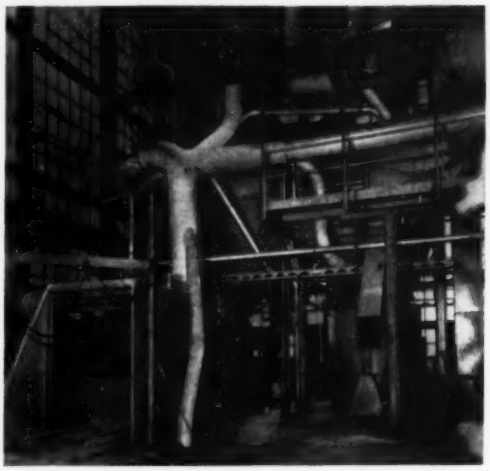

SCHEMATIC FLOWSHEET
of Minneapolis-Moline foundry at Hopkins, Minn. After sand has been separated from castings and molds on CA Shakeout, belt conveyor and hot sand bucket elevator elevate it to UP Vibrating Screen. From here it is distributed by belt conveyor with hand-operated plows to storage bins. Air-operated system charges the mullers, from which a belt feeder carries sand to prepared sand elevator. It is then aerated in a Revivifier.
HOT SAND ELEVATOR
UP VIBRATING SCREEN
BELT CONVEYOR
BIN
BIN
MULLERS
BELT FEEDER
PREPARED SAND ELEVATOR
REVIVIFIER
CA SHAKEOUT
BELT CONVEYOR

Modern system saves floor space, increases worker productivity, improves working conditions

WHEN Minneapolis-Moline Company wanted to mechanize the sand handling in the heavy casting area of their Hopkins (Minn.) foundry, they again called on Link-Belt. Several years earlier Link-Belt had solved a similar problem for them in an adjacent area.

Now, from the time molds reach centralized shakeout—until aerated sand is ready for the molders—everything moves mechanically . . . smoothly. Complete dust-collection system and elevated bins keep the floor clean and the air clear. Ample provision has been made for future expansion and further mechanization within the limits of present floor space. It's easy to see why Minneapolis-Moline recently awarded Link-Belt the contract for an even larger foundry mechanization project at another plant.

Don't pay a penalty for outmoded foundry handling. Chances are, mechanization by Link-Belt will more than pay for itself in a short time by boosting output . . . cutting operating costs . . . increasing worker productivity. A Link-Belt foundry engineer will be glad to talk it over with you. Just call the Link-Belt office near you today.



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Letters

Continued from page 197

due because of not meeting entrance standards. Quite naturally I was not very happy about the experience at the time, but I have come to know that it was probably the best thing that ever happened to me. I can also remember that the public speaking classes at Purdue did not include a very high percentage of engineers.

RUSSELL B. LEHE
Curtis Publishing Co.

Helps Start Career

AMERICAN FOUNDRYMAN is truly a great help to the inexperienced individual who wishes to learn the various aspects of foundry practice. I have discovered this from the very good articles which have appeared in the magazine. These have been most beneficial to me and I am planning to make foundry work my vocation.

JOSEPH T. STADLER
Notre Dame, Ind.

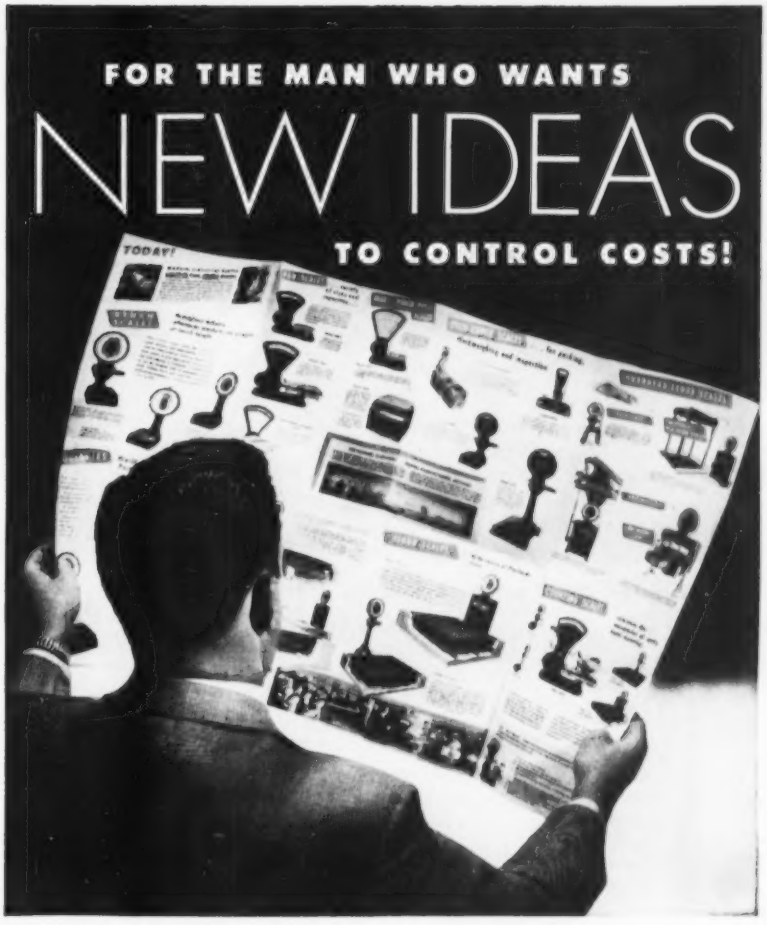
Finds Seat of Learning Hard

The following letter is a commentary on the A.F.S. Health and Safety Conference held at the University of Illinois February 17-19.

It has been my duty and pleasure to attend many safety conferences. Never before have I been worked so hard. Dean Robinson's remarks concerning "the seat of learning" might merit some consideration in the planning of future conferences. Considering the occupations and interests of those attending, it is my opinion from a safety engineer's point of view that an excellent choice of well-prepared and well-delivered subjects was presented.

While I could not agree entirely with all of the subject matter as presented by two speakers, we were given many things to think about and several good specific projects on which to work. We have taken several corrective measures and instituted one study as a result of our attendance.

JERRY WALTERS, *Safety Engineer*
General Steel Castings Corp.
Granite City, Ill.



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WATER DOES NOT HARM

AlSiMag® Ceramic STRAINER CORES

Water ruins SAND strainer cores. AlSiMag Strainer Cores are not affected by any amount of water—even a stream of water from a high pressure hose does not affect them!

Consider these other advantages, too!

COMPARISON TABLE

SAND CORES	AlSiMag STRAINER CORES
Disintegrate under rain or prolonged exposure to moisture.	NOT AFFECTED by water.
Must be handled carefully.	STRONG, stand fast, rough handling.
Some variation in size of cores and openings.	UNIFORM in all dimensions.
Eroded to varying degrees by stream of molten metal. Holes frequently enlarged as metal is poured.	NOT AFFECTED by stream of molten metal at normal pouring temperatures. Hole sizes remain uniform throughout pouring.
Eroded sand sometimes carried into casting by molten metal.	NON-SPALLING under normal metal pouring temperatures.
High percentage of breakage.	VIRTUALLY NO BREAKAGE.
Require hand reaming or cleaning of holes.	Clean, accurate, ready to use.

One foundry using 500 strainer cores per shift made a careful check on their costs of making sand cores. They thought their sand cores cost them practically nothing. They found that cost, including breakage, was 3c each.

The original cost of the AlSiMag core was less . . . and they got big dividends in faster handling, better castings, cleaner castings. If you will accurately check your own costs we believe you too will find that AlSiMag cores save you money! *Samples and prices on request.*

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51 ST YEAR OF CERAMIC LEADERSHIP

New Headquarters

Continued from page 103

cations as well as reproduction and mailing facilities.

Facade of the building will closely approximate the original plan announced in the April 1952 issue of AMERICAN FOUNDRYMAN, with some adjustment for the contour of the purchased site. It is recognized that the Headquarters building must in every way be a credit to the hundreds of individuals, companies and Chapters who thus far have contributed over $145,000 for its construction, while at the same time containing adequate provision for the present National Office Staff of 32 persons, with some allowance for the future.

Plan Proposal in 1950

The plan for a permanent A.F.S. Headquarters Building was first proposed at the Cleveland Convention in 1950 by Walton L. Woody, then Vice-President. A Housing Committee largely composed of past-Presidents, with R. J. Teetor of Cadillac, Mich. as Chairman was formed during the following year and determined on the type of building and general location during the Buffalo Convention of 1951. The plan was approved by the Board of Directors that July and an Action Subcommittee set up to carry through all details with the National Office Staff.

The Action Subcommittee comprises Mr. Teetor as Chairman, F. C. Riecks, and past-Presidents G. H. Clamer, H. S. Simpson, W. B. Wallis, and Walton L. Woody. The incumbent President of A.F.S. serves also on this committee, whose responsibility it is to carry the job through to completion.

Costs Have Risen

Active solicitation of additional funds for the building program was discontinued in 1951, at which time the original goal of $100,000 had been exceeded by over $30,000. As the building advances it is expected that additional contributions may be made by friends of the Society in consideration of the fact that the building plans undoubtedly now will cost more than the original estimates.

FEF Reviews

Continued from page 164

Clyde McQuiston, Ohio State University, stressed the importance of basic accounting courses for engineering students and stated that cost reduction, accounting and control are the three basic elements in all cost work. Dr. L. F. Mondolfo, Illinois Institute of Technology, recommended the use of aluminum, but not magnesium, for student engineer studies. He stated that aluminum can be used to illustrate shrinks, inclusions and contaminations, gassy castings, the effect of refining additions, and effects in practically all casting processes.

Dr. R. A. Flinn, University of Michigan, described foundry laboratory developments at his school, as well as the intensive course in advanced cast metals practice to be offered this fall for practicing. He stated that many "frontiers" of foundry knowledge still exist, and predicted that the most important melting advances in the next ten years will be in cupola practice. The advanced course in control techniques conducted at Purdue University was explained by Prof. C. T. Marek of that school, who advocated that teaching today should fit into the modern conception of engineering education, namely, the teaching of something useful. Final speakers Clyde M. Adams of MIT and Philip Rosenthal, University of Wisconsin, described two new foundry college text books, the latter an A.F.S. project now nearing completion for early publication.

The morning session ended with a panel on means of "*Attracting Students on the Campus*" into engineering curricula, participated in by D. C. Williams, Ohio State University; H. F. Taylor, MIT; C. C. Sigerfoos; and Fred Westermann, University of Cincinnati. Possible thesis subjects for doctor and master degrees were also suggested.

The final session Thursday afternoon consisted of a discussion of how the industry can best cooperate with engineering colleges and universities, and Prof. P. E. Kyle of Cornell University presented a summary of the conference and recommendations for future meetings.

Exhibits of A.F.S. literature and the services of other foundry associations, as well as FEF, showed a steadily growing trend toward development of educational helps, both in the schools and in industry. The entire conference, best attended to date, was described as more comprehensive and practical in application and interest than any previous event

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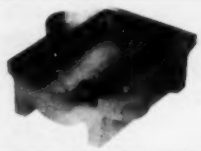

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Foundrymen

Continued from page 195

G. W. Linkhauer

Pittsburgh Engineering & Machine Co., Glassport, Pa., has named **G. W. Linkhauer,** vice-president-operations. He was formerly associated with United States Steel, Lewis Foundry & Machine, United Engineering & Foundry Co. in various engineering, manufacturing and plant operating capacities. **P. J. Castora,** formerly staff engineer with Alcoa's Pittsburgh office, has been appointed vice president-engineering and sales.

LeRoy A. Petersen, president of Otis Elevator Co., New York, has been elected a director of American Locomotive Co., Schenectady, N. Y.

C. Harold Johnson has joined Peninsular Grinding Wheel Sales Corp., Cleveland. He is a graduate of Case Institute of Technology and Western Reserve, and for the past ten years was methods engineer in charge of abrasives for TAPCO Div. of Thompson Products.

L. C. Perkinson was recently elected vice-president and **G. C. Walker** treasurer of American Cyanamid Co., New York. Mr. Perkinson had been treasurer of Cyanamid since 1945 and a director since 1946. Mr. Walker had been assistant treasurer since 1951.

William L. Batt, president, SKF Industries, has been awarded the Howard Coonley Medal, and Frank O. Hoagland, lecturer and inventor, received the Standards Medal for 1952. The presentations were made at American Standards Association's award luncheon. Both men were selected because of their leadership in the voluntary standards movement.

Continued on page 204

SE Regional

Continued from page 166

is at a maximum of about 45,000 psi when CE is 3.5.

As CE increases, said Prof. Jeffery, chill decreases and is not appreciable at or above 4.5. Hardness decreases as CE increases. Fluidity is maximum at CE 4.45 when the iron is poured at a constant temperature. Internal shrinkage increases with CE and with phosphorus, but CE influence is more pronounced than phosphorus up to 0.75 per cent. Graphite flakes increase one size with an increase of 0.50 in CE, the speaker concluded, and in general, tend to be Type A when CE equals 3.8. Machinability increases with CE and decreases about 10 per cent for a given CE as phosphorus goes from 0.20 to 0.70 per cent. Microstructure is a good indicator of machinability, he declared.

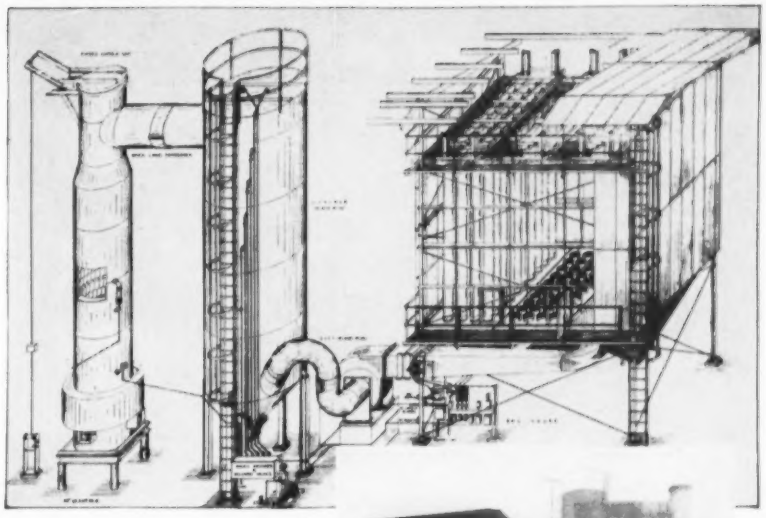
Final technical speaker was J. Robert Cardwell, Stockham Valves & Fittings, Inc. Sam F. Carter, Jr., American Cast Iron Pipe Co., was chairman of the session which was devoted to a discussion of practical cupola operation.

Hugh Comer Principal Speaker

Concluding the 1953 Southeastern Regional Foundry Conference was the annual banquet with Fred K. Brown presiding. Principal speaker was Hugh Comer, board chairman of Avondale Mills, Sylacauga, Ala., introduced for his talk, "*The New South*," by Charles Northen, U. S. Pipe & Foundry Co., Burlington, N. J.

Mr. Comer painted a picture of the future which calls for hard work and mechanization to create efficiency, profits, and more jobs. "Get the load off the muscles and put it on the motors" he advised his listeners.

In addition to Messrs. Brown, Drenning, and Worthington, conference planners included: Karl Landgrebe, Wheland Co., Chattanooga, Tenn., co-chairman, Program Committee; and the following who are chairman and co-chairman, respectively, of the committee designated: Entertainment, William K. Bach, Foundry Service Co., and Ross Martin, Jr., McWane Cast Iron Pipe Co.; Registration, Richard L. Jackson, Production Foundries Div., Jackson Industries, Inc., and Frank M. Robbins, Jr., Robbins & Bohr, Chattanooga; Publicity, J. P. McClendon, Stockham Valves & Fittings, Inc., and Porter Warner, Jr., Porter Warner Industries, Chattanooga; Plant Visitation, Mr. Martin, and Ernest C. Finch, American Cast Iron Pipe Co.; and Greeters, Morris L. Hawkins, Stockham Valves & Fittings, Inc., and Charles B. Saunders, Tennessee Products & Chemical Corp.



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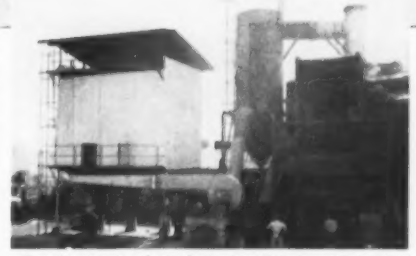

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Foundrymen

Continued from page 202

M. A. Dantzler

M. A. Dantzler, formerly works manager and in recent years assistant to vice-president-manufacturing at the Milwaukee plant, Universal-Rundle Corp., is now handling general sales and promotion for Walter Gerlinger, Inc., Milwaukee.

Edwin D. Nichols, sales and service representative, Hamilton Foundry & Machine Co., Hamilton, Ohio, recently retired. Prior to joining the company he was associated with the machine tool industry in the Cincinnati area for many years. **Stanley R. Hansen,** formerly with the Cincinnati plant of General Electric Co., has succeeded Mr. Nichols.

J. A. Bailey was recently named general manager, Dayton Malleable Iron Co., Dayton, Ohio. He joined the company in 1927 as a production department clerk, and later became finishing and core department foreman, supervisor of time study and rate departments, and plant superintendent in 1947. Since 1949 he has been assistant general manager of the company's G.H.R. Foundry Div. in Dayton.

C. Powell Whitehead, president and director, General Steel Castings Corp., Chicago, was recently elected a director of the St. Louis-San Francisco Railway.

National Bearing Div., American Brake Shoe Co., New York, has appointed **Sam R. Watkins,** executive vice-president. He will transfer to St. Louis, Brake Shoe has also announced three appointments by the sales department. They are: **John F. Ducey, Jr.,** vice-president; **George E. Anne,** assistant vice-president, and **Daniel J. Wagner,** district sales manager.

Continued on page 205

Foundrymen

Continued from page 204

F. S. Middleton

Fred S. Middleton, has been appointed sales manager of DeBardeleben Coal Corp., Birmingham, Ala. Mr. Middleton, who is a graduate of University of Tennessee, has had a wide experience in the iron, steel, and foundry industry.

John Taylor, Lester B. Knight & Associates Inc., Chicago, was recently elected *vice-president* of the Chicago Chapter, American Institute of Industrial Engineers. Other new officers include **V. F. Trost,** Continental Can Co., *president;* **John W. Murchie,** Republic Steel Corp., *secretary,* and **Claude W. Campbell,** Acme Steel Co., Treasurer.

Electro Refractories & Abrasives Corp., Buffalo, N. Y. has named the following grinding wheel sales engineers: **John E. Courtney,** Detroit; **Charles W. Anthony,** Central Ohio; **Sterling Muck,** Pittsburgh; **Peter Antonez,** New England States; and **Robert C. Hebard,** Buffalo. Other changes include the transfer of **Frank L. Doerr, Jr.** from Detroit to Cleveland, and **William J. Eames** from Buffalo to Chicago.

Chicago Foundrymen's Association recently presented the first special service awards to be given since its founding to three former officers and early members of the organization. The testimonial plaques were presented at a dinner meeting to **Hermann F. Lehmpuhl,** Sheffield Foundry Co.; **William J. Michel,** retired; and **Robert D. Phelps, Sr.,** Francis & Nygren Co. in appreciation of their many years of service in advancing the interest of the foundry industry.

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Obituary

Martin A. Pederson, 59, owner of the Bison Pattern Shop, New York, died February 3. He had been in ill health for an extended period. Mr. Pederson, a veteran of World Wars I and II, was born in Bergen, Norway, and came to Buffalo as a youth. Between the two wars he worked for the U. S. Government in Europe and Russia, demonstrating the use of modern machine equipment.

Stephen Garfield Hodgson, head of the Hodgson Foundry Co., Chicago, died recently.

Walter W. Patnoe, chief engineer for Basic Refractories Inc., Cleveland, died of a heart attack at his home in Bay Village, Ohio, March 1. Mr. Patnoe joined Basic as plant engineer and construction superintendent in 1916. He was a recognized authority in rotary kiln processing and had designed and supervised the construction of the rotary kiln plant for processing magnesite at Babbs, Nev., and also a new plant to make dead burned dolomite at Maple Grove, Ohio.

Fred K. Brown, president of Fred K. Brown Co. Inc., Birmingham, Ala., died February 28 after a brief illness. He had held offices in the Birmingham District chapter for more than 12 years and was chairman at the time of his death. When the Southeastern Conference was held at Birmingham February 19-20 he presided. Before forming his own company, he had been sales manager for Adams, Rowe & Norman, Inc. for years.

Cope and Drag Club Meets

Possible foundry uses of sperm whale oil, dry reclamation of foundry sands, and sand expansion were discussed at the quarterly meeting of the Cope and Drag Club held February 11 at the Schroeder Hotel, Milwaukee. Club President Jos. S. Schumacher, Hill & Griffith Co., Cincinnati, presided.

O. J. Myers, Archer-Daniels-Midland Co., Minneapolis, told how sperm whale oil is secured and suggested possible foundry uses for it. It is a saturated oil, he said, and does not oxidize and become gummy. Its viscosity does not vary greatly with temperature and the oil wets metal readily.

C. E. Wenninger, National Engineering Co., Chicago, outlined the development of electrostatic and pneumatic reclamation of molding sand, and pointed out the important role fines (not clay) play in reducing core strength.

Frank S. Brewster, Harry W. Dietert Co., Detroit, led a discussion of a recent British paper on sand expansion.

Officers elected to take over at the May meeting are: *president,* Eugene W. Smith, Chicago; *vice-president,* Bradley H. Booth, Carpenter Bros., Inc., Milwaukee; and *secretary-treasurer,* Herbert F. Scobie, technical editor, AMERICAN FOUNDRYMAN, Chicago.

New Shell Molding Data

Two reports on shell molding have just been released by the government. *"Report of Investigation of the Shell Molding Process,"* PB 111004, covers work by B. N. Ames and S. B. Donner of the New York Naval Shipyard, Brooklyn. *"Application of Shell Molding to the Production of Magnesium Castings,"* PB 111049, is a report on the U. S. Army Ordnance Corps by Dow Chemical Co., Midland, Mich.

The Navy report describes the experimental production of shell-mold castings in aluminum, nodular iron, and carbon steel. Advances covered in the report include: (1) design and fabrication of equipment for making shell molding on a job lot basis; (2) tests to develop the best materials and techniques for the process; and (3) tests to determine the metallurgical characteristics for the process of shell mold casting production.

The bulletin on casting of magnesium describes experiments and results of applying inhibitors as mold washes, mold flushes, and sand-resin mix additions. Also covered are studies on improving shell core breakdown, and tests for the evaluation of sand-resin mixes.

Both reports may be obtained from Office of Technical Services, Department of Commerce, Washington 25, D. C. Send $1.50 for PB 111004, 75c for PB 111049.

Redesign Contest Open

Redesign of a competitive product for production in gray iron will again be recognized through the Gray Iron Founders' Society annual Redesign Contest. Purpose of the competition, which is open to anyone in the metal working industry, is to encourage more extensive use of gray iron by giving recognition to those who have successfully substituted gray iron for other materials.

Cash awards totalling $500 will be divided among Redesign Contest winners as determined by the judges. No advance registration is necessary but all entries must be submitted by May 1, 1953, to: Gray Iron Founders' Society, Inc., 210 National City-E. 6th Bldg., Cleveland 14, Ohio. Awards will be presented at the GIFS 25th anniversary meeting in St. Louis in October.

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Books

Continued from page 180

sion factors, applications of materials and the properties of elements. This book should be a handy and essential reference work for the technical personnel of all metal-using industries.

Thermal Treatment

Equipment for the Thermal Treatment of Non-Ferrous Metals and Alloys . . **104 pp., illustrated with excellent half-tones and graphic data. Published by The Institute of Metals, 4 Grosvenor Gardens, London, S. W. 1, Eng. $2.50. (1953)**

A symposium held in London on March 26, 1952, covered the seven papers presented in this book. The general discussion that followed the papers is also printed. The publication is valuable for the light it throws on European thinking on heat treatment of the non-ferrous metals and alloys.

Open Hearth Proceedings

Open Hearth Proceedings, 1952 . . **460 pp. Illustrated with photos, charts, tables. Published by American Institute of Mining and Metallurgical Engineers, 29 W. 39th St., New York 18, N. Y. (1952)**

This book contains all the proceedings of the 35th Annual Conference of the National Open Hearth Committee of the Iron and Steel Division, AIME, held at Pittsburgh, March 31-April 2, 1952. All papers and discussions presented at the Conference are recorded in the volume, which is profusely illustrated with line cuts and half-tones. A total of 53 papers are included, covering both acid and basic open hearth practice.

Investment Castings

Investment Castings for Engineers . . **477 pp. Illustrated. By Rawson L. Wood and Davidlee Von Ludwig. Published by Reinhold Publishing Corp., New York, N. Y. $10.00. (1952)**

The authors have produced a book that offers an unusually comprehensive description of the salient features, advantages and limitations of investment castings as now used in the metal working industries. All metallurgical data are derived from actual tests of investment cast specimens. Detailed description of recent techniques is included. The frozen mercury method has been covered in detail for the first time in print. The book should be valuable to all technologists and students in the metal casting and related fields.

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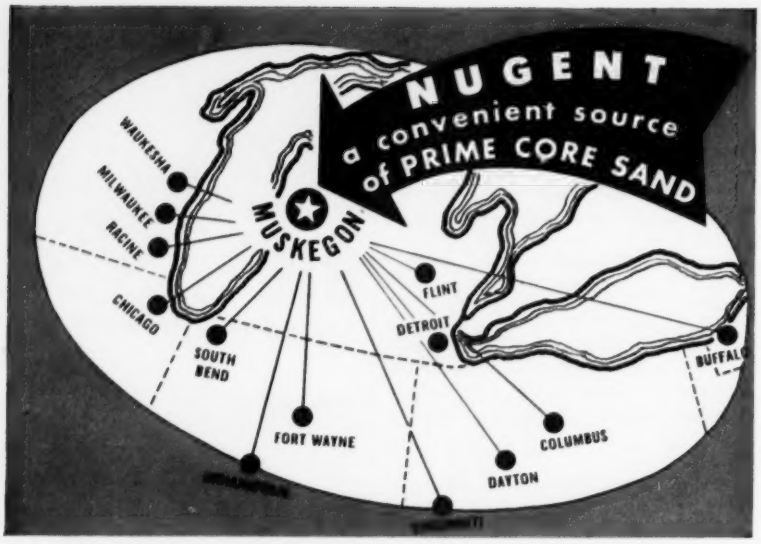

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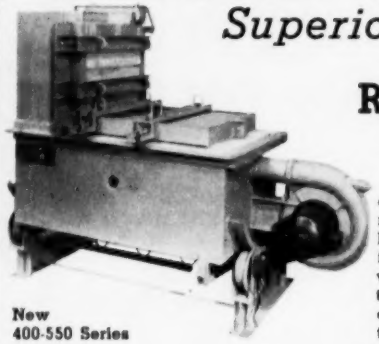

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LARGER MODELS ON REQUEST
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Chapter News

Continued from page 192

pany's "grooving electrode," which will prepare cracks in castings for welding in one operation. The program evoked an enthusiastic comment from Verne Righter, Saginaw Malleable Iron Co., who remarked that if the molders hear of these processes, they will only make a piece of iron and let the welders make a casting of it.

Guest speaker at Philadelphia Chapter's annual Management Dinner on April 21 will be S. M. Jenks, United States Steel Corp., Pittsburgh.

Philadelphia

D. E. Best
Bethlehem Steel Co.

The Philadelphia Chapter has announced that its Management Dinner will be held at the Barclay Hotel, Philadelphia, on April 21, 1953. Attendance is limited to Chapter Members and management personnel of foundries and allied industries by invitation only.

Speaker for the occasion will be S. M. Jenks, President in charge of Manufacturing for U. S. Steel Corp., Pittsburgh, Pa.

Mr. Jenks, an engineering graduate of Cornell University, got his first steel industry job as a blast furnace blower. He has been connected with United States Steel Corp. since 1925.

Magazine Issues Microfilmed

Microfilms of articles appearing in AMERICAN FOUNDRYMAN during 1950 and 1951 have just been received by A.F.S. from University Microfilms, Ann Arbor, Mich. All issues of the magazine are available in the form of microfilm at the Michigan service, to be used with reading machines giving enlargement of 19 times or more.

Chapter Meetings

April

16. . Penn State
Foundry Classroom, Penn State College, State College, Pa. J. C. Kremer, Central Foundry Div., General Motors Corp., *"Shell Molding Production."*

17. . Texas
Lufkin, Texas. Afternoon meeting, Texas Foundries, Inc. Jolt-squeeze molding machine demonstration. Fred G. Sefing, International Nickel Co., New York. *"Management's Responsibility for Education in the Foundry."*

17. . Birmingham District
University of Alabama, Tuscaloosa, Ala.

17. . Tri-State
Bartlesville, Okla.

20. . Quad City
Fort Armstrong Hotel, Rock Island, Ill. Boss' Night. Charles Arp, Allis-Chalmers Manufacturing Co., Milwaukee. *"Our Most Valuable Asset."*

21. . Philadelphia
Barclay Hotel, Philadelphia. Management dinner meeting. S. M. Jenks, U. S. Steel Corp., Pittsburgh.

24. . Chesapeake
Engineers' Club, Baltimore. Bernard N. Ames, New York Naval Shipyard. *"Shell Molding."*

24. . Tennessee
Patten Hotel, Chattanooga, Tenn. S. C. Massari, Technical Director A.F.S. *"Effect of Gating Design on Casting Quality."*

27. . Northwestern Pennsylvania
Moose Club, Erie, Pa. T. E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago. *"Casting Defects as Related to Sand Practice."*

May

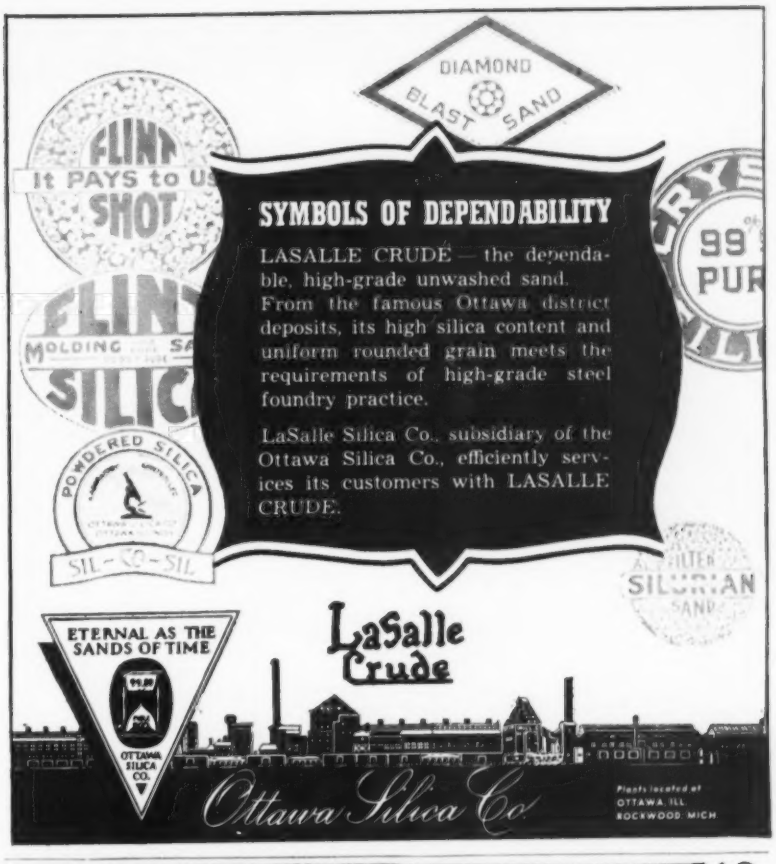
4. . Western Michigan
Bill Stern's Steak House, Muskegon, Mich. Earl E. Woodliff, foundry sand engineer, Detroit. *"Sand Control."*

4. . Central Illinois
American Legion Hall, Peoria, Ill. B. H. Taylor, B. F. Goodrich Co., Akron, Ohio. *"Today's Challenge in Human Relations."*

7. . Western New York
Hotel Sheraton Hotel, Buffalo, N. Y. Smorgasbord. Installation of officers.

8. . Philadelphia
Engineers' Club, Philadelphia, Pa. Wilbur S. Walters, La Grange Shell Molders, Inc., La Grange, Ind. *"Shell Molding."*

8. . Eastern Canada
Mount Royal Hotel, Montreal, Que. Annual business meeting.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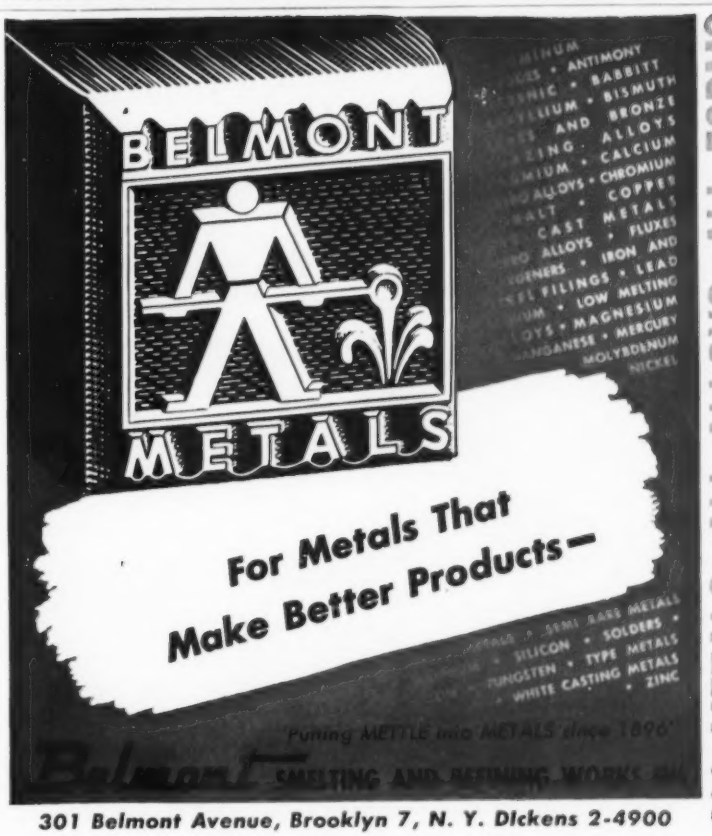

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8. . Wisconsin
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11. . Central Ohio
Seneca Hotel, Columbus, Ohio. Leslie A. Gardner, Pangborn Corp., Hagerstown, Md. *"Mechanized Cleaning."*

11. . Timberline
Oxford Hotel, Denver, Colo. Joseph F. Schumacher, Hill & Griffith Co., Cincinnati. *"Sand Control & Synthetic Sands."*

11. . Cincinnati
Clifford E. Wenninger, National Engineering Co., Chicago. *"Pneumatic Reclamation for Foundry Sands."*

12. . Rochester
Seneca Hotel, Rochester, N. Y. Election of officers.

12. . Twin City
Covered Wagon, Minneapolis. Round Table: *"What Have We Learned This Year."*

12. . N. Illinois - S. Wisconsin
Beloit Country Club, Beloit, Wis. Round Table. Moderator—R. W. Thayer, Gunite Foundries Corp., Rockford Ill. *"What's Wrong with This Casting and Why."*

14. . Saginaw Valley
Fischer's Hotel, Frankenmuth, Mich. Morris Bean, Morris Bean & Co., Yellow Springs, Ohio. *"Precision Castings."*

14. . Northeastern Ohio
Tudor Arms Hotel, Cleveland. Past presidents' and old timers' night. Entertainment.

14. . St. Louis
York Hotel, St. Louis.

15. . Central New York
Onondaga Hotel, Syracuse, N. Y. John N. Ludwig, Jr., Electro Metallurgical Co., Div. Union Carbide & Carbon, Pittsburgh. *"Gray Iron Metallurgy."*

15. . Texas
Galveston. Business meeting and election of officers.

15. . Tri-State
Coffeyville, Kan.

16. . Washington
Elks Club, Bremerton, Wash. Social meeting.

18. . Central Indiana
Athenaeum, Indianapolis. Harold C. Weimer, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, Ill. *"Foundry Mechanization."*

18. . Metropolitan
Essex House, Newark, N. J. R. L. McIlvaine, National Engineering Co., Chicago. *"Foundry Mechanization."*

18. . Quad City
Fort Armstrong Hotel, Rock Island, Ill. Joseph Gitzen, Delta Oil Products Co., Milwaukee. *"Core Sand Additives."*

18-21 . . Northwestern Pennsylvania
Academy High School, Erie, Pa. Sand School. Instructor, Frank S. Brewster, H. W. Dietert Co., Detroit.

19 . . Eastern New York
Circle Inn, Latham, N. Y. Brass-bronze session. Election of officers.

20 . . Central Michigan
Hart Hotel, Battle Creek, Mich.

21 . . Washington
Everett, Wash.

21 . . Detroit
Detroit Leland Hotel. Casting defects meeting. Herbert F. Scobie, Technical Editor, AMERICAN FOUNDRYMAN. "*Foundry Progress.*"

22 . . Ontario
Royal York Hotel, Toronto, Ont. Annual meeting and entertainment.

22 . . Tennessee
Patten Hotel, Chattanooga, Tenn. Round table discussion and "stump the experts" meeting.

22 . . Chesapeake
Engineers Club, Baltimore, Md. "*Foundry and Metallurgical Techniques,*" movie.

Apprentice Merit Rating Tested in Scotland

Apprentice merit rating is a part of a comprehensive training program introduced recently at Smith & Wellstood Ltd., and Mitchell, Russell & Co. Ltd., ironfounders, Bonnybridge, Scotland, according to an announcement in *Target*, a British publication.

Bonuses are awarded quarterly on the basis of reports made by the training supervisor, foundry manager, and shop foreman. Each apprentice is judged by a point system which has been worked out in five categories—1. Workmanship and progress (maximum, 35 points), 2. Industry and perserverance (maximum, 25 points), 3. Co-operation and general attitude (maximum, 20 points), 4. Conduct and appearance (maximum, 15 points), and 5. Timekeeping and attendance (maximum, 5 points).

No bonus is paid for scores of 50 points or less. Above 50, bonuses are graduated (according to points scored) up to 15 shillings a week. Each apprentice is allowed to examine the records the others make, so that merit rating is placed on a competitive basis.

The training program is carried out in cooperation with local schools and national foundry organizations. It begins with a three-month probationary period.

If merit-rating reports are satisfactory at the end of the three-month period, an Apprentice Agreement is entered upon for a five-year period of comprehensive training. Certificates of Apprenticeship are awarded at the conclusion of this training period.

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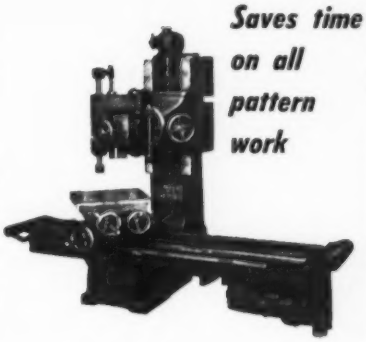

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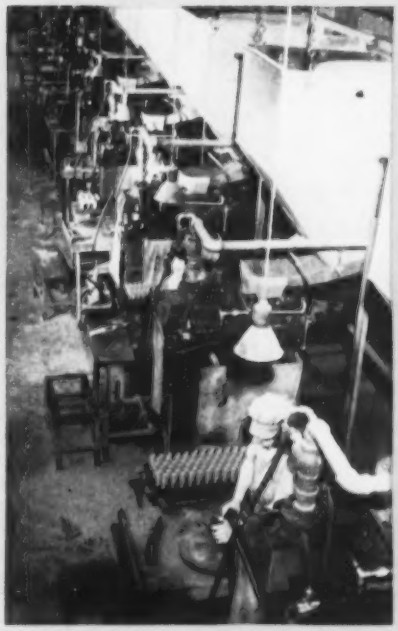
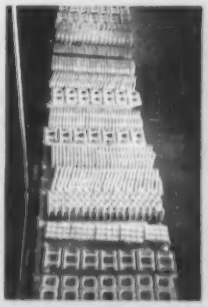


A section of one side of the double row of high-speed blowers in Grabler's core department. Conveyor to oven runs down the center . . . is 126 feet long. This means a long "ride" for cores, calls for high green strength.



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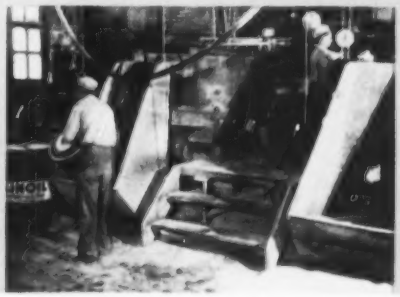

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